

HAMPDEN COUNTY REGISTRY OF DEEDS

DAMS FILE COLLECTION

BOOK D25—1 (A-G)

Reports Section—Dams- Hampden County Massachusetts

Donald E. Ashe,
Hampden County Register of Deeds

TABLE OF CONTENTS ~ REPORTS FOR HAMPDEN COUNTY
Book 1

Agawam Dam Inspections—1969

Brimfield (East) Dam & Reservoir—1957

Brimfield (East) Dam Map—1950

Brimfield Dam Inspections—1951-1956

Chester Dam Inspections—1970

Chicopee—Bemis Pond Dam Repairs—1957

Chicopee—Cooley Brook Watershed—1914

Chicopee Dam Inspections—1960-1964

Chicopee Water Works Takings—1893

Chicopee—Szot Park, Bemis Pond Dam—1954

Connecticut River Flood Control—Conant Brook Dam Vol. I 1964

Connecticut River Flood Control—Conant Brook Dam Vol. II 1964

Connecticut River Flood Control—Conant Brook Dam Vol. III 1964

Connecticut River Flood Control—Westfield
Local Flood Protection Project 1963

Connecticut River Flood Control—Westfield
Westfield River Littleville Dam Vol I 1962

Connecticut River Flood Control—Westfield
Westfield River Littleville Dam Vol II 1962

Connecticut River Flood Control—Westfield
Westfield River Littleville Dam Vol III 1962

Connecticut River Flood Control—Westfield
Westfield River Littleville Dam Plans - 1962

TABLE OF CONTENTS ~ REPORTS FOR HAMPDEN COUNTY
Book 1

Connecticut River Hydro-Electric -1955

Connecticut River Intercepting Sewer, Agawam Pumping Station 1963

Connecticut Valley Water Control Association

Connecticut Valley Water Control Association,
New England Flood Control Map 1957

Dam Legislation Letter 1956 Worcester County Commissioners

East Longmeadow Dam Inspections 1956-1963

Eastern Photo vs. Berman's Motor Express

Granville Dam Inspections 1959-1970

Agawam - Dam Inspections of 1969



1969 Reports

Inspections by Tighe & Bond.

City/Town	Agawam
Dam	Zerra Dam
Dam	Rising Dam
Dam	Mawaga Dam
Dam	Provost Dam
Dam	Gogulski Dam
Dam	Robinson Park Dam
Dam	West Springfield Turnverein
Dam	DiDonato Dam
Dam	Silver Lake Dam
Dam	West Springfield Fish & Game Club Dam

GEORGE H. M. DONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Agawam
March 17, 1969

This letter sent to the following:

West Springfield Fish & Game Club, 329 Garden St., Agawam, Mass.
Mr. S. Zerra, 223 Garden St., Feeding Hills, Agawam, Mass.
Mr. P. Provost, 227 Garden St., Agawam, Mass.
Commonwealth of Mass., Robinson State Park, North St., Agawam, Mass.
Attn: Park Supt.
West Springfield Turnverein, Garden St., Agawam, Mass.
Mawaga Sportsmen's Club, Adams St., Agawam, Mass.

Reference is made to your dam in the Town of Agawam, and the fact that there now exists a heavy snow cover throughout Western Massachusetts. The water content of this snow cover, coupled with a warm spring rain could result in extremely heavy runoff conditions. Consequently, the Commissioners of Hampden County have directed that I advise you to be sure that the spillway facilities at your dam are clear of any obstruction and that you take all precautions necessary to protect your dam as well as persons and property downstream.

It is advisable that you also lower the water level of the stored water through use of drawdown gates, and that this lowering be done at this time under controlled conditions so as not to drop the water level at too fast a rate wherein the embankment of the dam might be damaged or the rate of discharge could cause temporary flooding downstream.

If you have any question in connection with this matter, the undersigned can be reached at the above address and telephone number.

Very truly yours,

George H. McDonnell
County Hydraulic Engineer

GHM/amd

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

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BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Agawam
October 8, 1969

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Inspections of dams situated within the Town of Agawam have been completed recently and each dam within Agawam has been examined at least once during 1969. The following is a report on the general condition of the various dams situated within the Town of Agawam.

A. Gogulski Dam

This is a very low dam and though it receives little maintenance or attention, it is safe. It has a very small spillway and the opening to the spillway is usually nearly completely blocked with stoplogs.

The embankment is only about 3 ft. to 4 ft. in height at its highest section and averages only about 2 ft. in height for the majority of its length. The embankment is nearly 15 ft. wide across the top. The sloping face on the pond side is paved with fieldstones.

The dam can pass flood flows over the embankment at the right of small spillway. The embankment is wide and low and is well compacted, at the right of the spillway. Overflowing flood water passes over and around the dam embankment almost entirely on natural ground.

Except for the fact that the dam impounds a sizeable pond containing over one million gallons of water and the drainage area involved is slightly in excess of one square mile, this small structure would not come under County jurisdiction.

B. Rising Dam

The embankment forming this dam carries the town street known as Southwest Street. The embankment is wide in comparison to its relatively shallow height. The road paving shows no evidence of settlement or cracking.

The slopes of the embankment are tree and brush covered. However, because of the great width in relationship to the shallow embankment height, this growth does not endanger the dam.

The spillway tube inlet was found to be okay. The riprap paving in the bottom of the pond directly in front of the inlet was found to be in good condition. The tube itself as well as the inlet was free of any debris or obstruction. The outlet end of the tube was satisfactory. Little or no erosion was observed in the rock paving of the brook bed.

Water level in storage was at the crest of the riprap inlet paving leading to the spillway tube.

The toe area of the embankment was found to be dry and satisfactory.

In the opinion of the undersigned, this dam is safe.

C. DiDonato Dam (West Springfield Turnverein)

The concrete wall on the upstream face of the earth embankment has failed in one location. It should be rebuilt or repaired. The sunken portion of the embankment behind the failed wall should be filled with compacted earth.

The grate on the spillway opening was clear of any debris. Stoplogs in place were at normal elevation and water level in storage in the pond was a few inches below the crest of the upper stoplog.

The top of the embankment has a fair turf cover. However, this cover should be improved thru fertilizing and seeding. Brush and vine growth on the downstream slope of the embankment should be cleared and a turf cover developed on this portion of the dam.

Spillway capacity at this dam should be increased. This could be accomplished by the construction of a properly shaped and paved swale spillway. The swale could be built on natural ground at the right end of the dam.

It is recommended that the owner be advised of the needed repairs and also be instructed to build the additional spillway capacity within the next year.

D. Zerra Dam

No changes have been made at this dam since the time of the last inspection. The dam appears to have been abandoned by the owner. The embankment is in poor condition. Holes and eroded areas were noted and it is becoming overgrown with weeds and small brush.

Only the lower stoplogs were in place in the spillway notch and water level in storage was at a low elevation. The masonry spillway structure is in need of repairs.

If this dam is to remain active, then it should be properly maintained and the swale spillway previously recommended should be built on natural ground around the right end of the embankment.

As existing the dam is not safe. However, the chance that the dam will fail is very small. Should the spillway become plugged with debris and heavy run-off conditions occur, it is quite possible that the pond elevation would rise to the top of the earth embankment and the storm flow would pass over the earth embankment. Based upon its present condition, this embankment could not withstand a prolonged overflow without formation of a gully or gullies and resulting failure of the embankment.

The owner should be advised to either properly repair and maintain the dam or breach it and thus abandon the dam.

E. Provost Dam

The concrete of the spillway is in good condition. Stoplogs in the front are at the usual elevation and water level in storage in the pond is at the crest of the upper stoplog.

The top of the embankment is o.k. It has a fairly good turf surface. The sloping side of the embankment toward the pond should be cleared of all brush growth and a good turf should be developed on this surface of the embankment.

The downstream slope of the embankment should be cleared of all brush and tree growth. A turf similar or better than that on the top of the dam should be developed on the downstream slope. The toe area of the dam is wet at one location and rather soft. This condition has been noted in the past. If any movement to the toe water is ever observed, the entire area must be weighted with a graded gravel.

The outlet area from the twin spillway tubes was in satisfactory condition.

Piles of earth reported on the embankment at the time of the previous inspection are still in the same location and in the same general condition. This stored material should be placed in its proper and final location. As existing, any overtopping of the embankment would result in the overflowing water being directed towards the spillway section where the dam has its narrowest dimension. Thus, these mounds of earth could contribute to the failure of the dam.

The swale spillway recommended for construction in previous reports has not as yet been built. The wife of the owner was present on the day of inspection and stated that the owner has the construction scheduled for this fall and is now awaiting the arrival of earth moving equipment.

In the opinion of the undersigned, the dam is safe under normal stream flow and operating conditions and provided that the small diameter twin spillway tubes do not become plugged. Should precipitation or snow melt conditions be such that extremely heavy run-off occurs and water in storage rises to the top of the dam, the dam then will be unsafe and will fail very rapidly. In view of the fact that this condition could occur and in view of the fact that the owner of the dam has been advised a number of times in the past to provide adequate and additional storage capacity, it is recommended that if the additional spillway is not built within the next six months, the owner be given a directive to draw down the pond, breach the embankment and abandon the dam.

F. West Springfield Fish and Game Club Dam

All brush growth should be cleared from the sloping faces of the embankment. This applies to the pond side of the embankment as well as to the downstream side. All vine growth should be killed and the entire toe area of the embankment opened up, loamed and seeded. It is essential that a good growth of turf be developed over the entire embankment surface at this dam.

All debris and logs floating on the pond in front of the spillway should be removed. Debris and logs in the spillway shaft should be cleaned out.

At the downstream end of the spillway conduit the protective end wingwalls have broken off and this area of the embankment is subject to erosion. Loss of the toe of the embankment could occur at this location. The owners should be directed to construct proper facilities at the spillway conduit discharge end and to clear the embankment of all undesirable growth. Failure to comply with this recommendation within the next 9 months should result in breaching of the dam.

G. Silver Lake Dam

The earth embankment sections of this dam are satisfactory. The right section is wide in relation to its height and is well maintained. It has a good sod cover.

The left embankment section is not maintained or trimmed. It is covered with some brush growth but at present the brush growth does not endanger the dam.

The concrete masonry of the overflow section proper is o.k. The above water training walls on each side of the spillway and the downstream masonry abutment walls of the old structure have now deteriorated to a point where repair work must be done or the masonry should be replaced.

The elm tree growing at the right abutment, just back of the right abutment wall, should be cut down and the root structure killed.

The toe area of the overflow section is o.k. On the day of inspection water level in storage was at the concrete crest of the spillway and no flashboards were on the crest.

In the opinion of the undersigned, the dam is safe. Within the next twelve months, however, repair work should be done to masonry as recommended and the tree should be cut down. Failure of the owner to comply with this recommended work could result in the dam becoming unsafe.

H. Mawaga Dam

The concrete vertical shaft spillway is in satisfactory condition. All of the screens on the inlet ports are partly blocked with debris and should be cleaned.

The downstream face of the concrete and the stone masonry main overflow will be in need of repairs as weather and water erode and wash away the cracked areas on the downstream face at the right side.

The embankment is satisfactory as to shape and top surface. The sloping surface on the pond side and on the dry side of the embankment section should be cleared of all brush growth and a good turf developed on both sloping surfaces. This turf should be maintained. The toe area is wet but about normal.

On the day of inspection no flashboards were on the crest of the main overflow spillway and water level in storage was at crest elevation.

It is recommended that the owner of the dam be advised to remove the brush growth, to develop a turf cover on the embankment and to clean the screens in front of the ports of the vertical shaft spillway.

I. Robinson Park Dam

On the day of inspection the pond was empty and the drawdown gate was open. The spillway structure was in very good condition. The entire structure could be examined because the pond was empty. The concrete shows very little evidence of any wear, weathering or erosion. Wingwalls and the inlet to the spillway conduit are in good condition.

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The embankment was okay. It is well shaped and has a good turf cover. It is very wide for its height. The road running the length of the embankment showed no evidence of cracks or settlement.

The spillway conduit through the embankment was noted to be o.k. It was clear of any debris. At the outlet end, the concrete wall of the conduit and both wingwalls are still badly undermined as previously reported. This undermining has been caused by turbulence of the discharging water. Repair work should be done as soon as possible to prevent any major damage to the masonry.

Repairs could be made very economically and easily if they are done now. Flow of water thru the conduit could be stopped by closing the gate. A load of a few yards of concrete brought into the site by a transit mix truck could be discharged directly to the bed of the stream at the outlet of the conduit by chutes from the truck. The concrete so deposited could be worked under the end wall and the wingwalls of the discharge facilities. No form work would be needed at all. Simply a few yards of concrete and two laborers with spades and shovels could work the concrete under the wingwalls and the end wall. In all probability the cost of the repairs will total less than $100.00 if accomplished in the near future. A delay in making the repairs could result in much more expensive repair work at a later date.

The undermining or the masonry was first reported three years ago. Repairs should be delayed no longer.

In the opinion of the undersigned the dam is safe. However, if the recommended repairs are not made in the near future, at a very minimum cost much more expensive repairs will probably be needed in a year or two.

Respectfully submitted,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

E.D.

GHM/ekd

East Brimfield Dam and Reservoir -1957



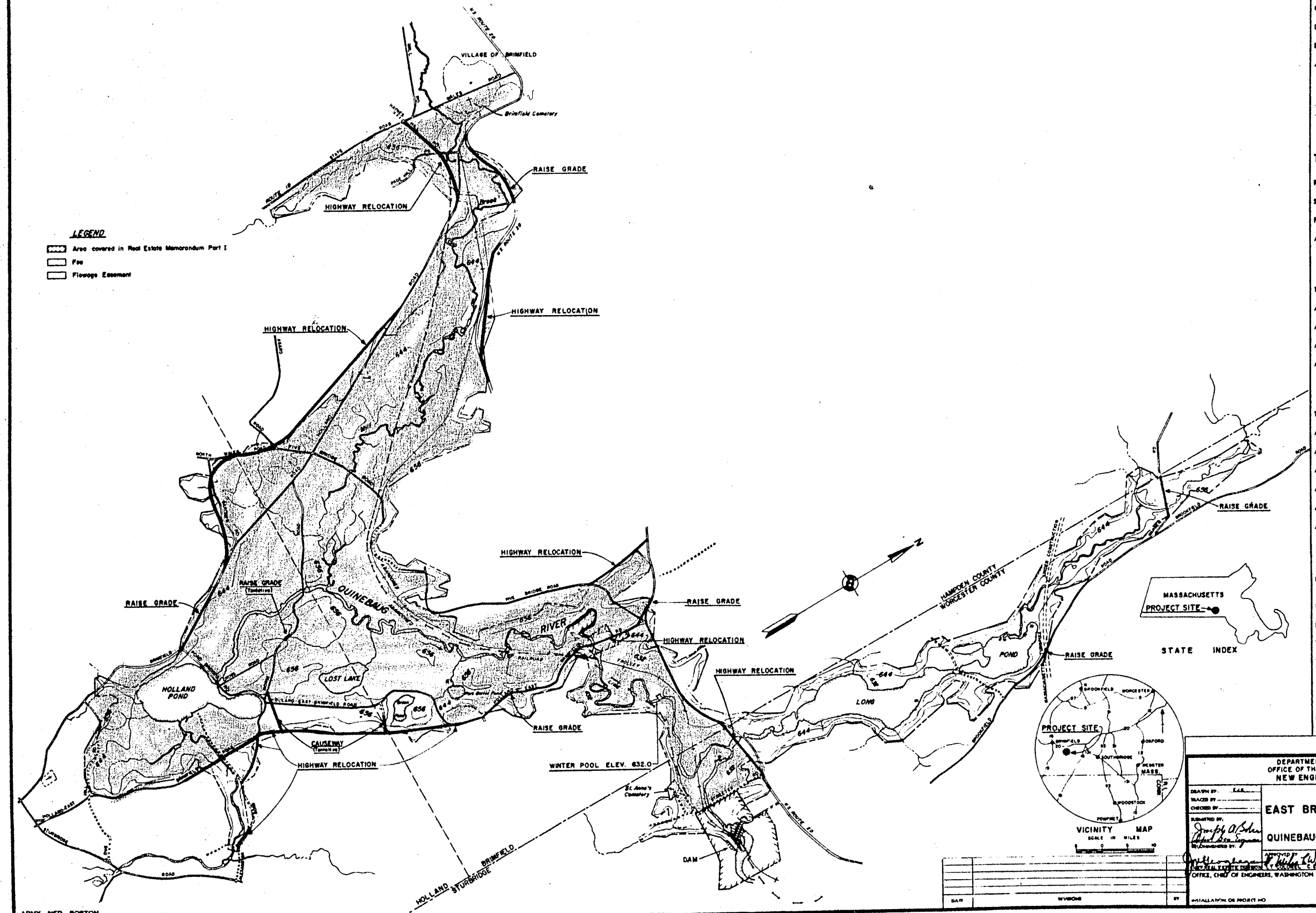
1957 Reports

Bid specifications.

City/Town	Brimfield
City/Town	Holland
Dam	East Brimfield Dam & Reservoir
Name	Massachusetts Comm
Name	U S Army Engineers
Water	Quinebaug River
Water	Holland Pond

CORPS OF ENGINEERS

U. S. ARMY



PROJECT MAP

AGENCY: DEPT. OF THE ARMY

STATE MASSACHUSETTS

COUNTY WORCESTER CO. & HAMPDEN CO.

DIVISION NEW ENGLAND

DISTRICT

ARMY AREA FIRST

LOCATION OF PROJECT

25 MILES SW OF WORCESTER

8 MILES NW OF SOUTHBRIDGE IN EAST BRIMFIELD, MASS.

TRANSPORTATION FACILITIES

RAILROADS NEW YORK, NEW HAVEN & HARTFORD

STATE ROADS 19

FEDERAL ROADS 20

AIR LINES

ACQUISITION

TOTAL ACRES ACQUIRED

ACRES FEE

ACRES TRANSFERRED

ACRES LEASED

ACRES LESSER INTERESTS

DISPOSAL

TOTAL ACRES DISPOSED OF

ACRES SOLD

ACRES TRANSFERRED

ACRES LEASES TERMINATED

ACRES LESS. INT'S. TERMINATED

ACRES REASSIGNED

ACRES TO

LEGEND

EXCEPT FOR THE SPECIAL SYMBOLS SHOWN BELOW MAP SYMBOLS ARE STANDARD IN ARMY MAP SERVICE TECHNICAL MANUAL NO. 11.

RESERVATION LINE

RESERVATION LINE (Annual Grass)

TRACT BOUNDARY LINE

TRACT NUMBER

AVIGATION EASEMENT

CONTOUR LINE

DISPOSAL

DEPARTMENT OF THE ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION

DRAWN BY: E.A.R.
TRACED BY:
CHECKED BY:
SUBMITTED BY:
RECOMMENDED BY:

REAL ESTATE
EAST BRIMFIELD DAM & RESERVOIR
RESERVOIR MAP
QUINEBAUG RIVER, MASSACHUSETTS

APPROVED
CHIEF, REAL ESTATE DIVISION, LT. COLONEL, C.E. Actg DIVISION ENGINEER
OFFICE, CHIEF OF ENGINEERS, WASHINGTON 25, D. C.

DATE APRIL 1957

DATE | REVISIONS | BY

INSTALLATION OR PROJECT NO

SCALE IN FEET
1000 0 1000 2000

SHEET 1 OF 1 | DRAWING NO. NED-Re-1363

ARMY - NED - BOSTON

To accompany Real Estate Memorandum dated April 1957.

EXHIBIT "E"

Eng. Form 1000-a
28 JAN. 52

Standard Form 30 (Revised June 1955)
Prescribed by General Services Administration
Regulation 1-11-209.00

INVITATION AND BID
(SUPPLY CONTRACT)

ISSUED BY: U. S. Army Engineer Division, New England Corps of Engineers

DEPARTMENT: Army

ADDRESS: 150 Causeway Street, Boston 14, Massachusetts

INVITATION FOR BIDS

DATE ISSUED: 16 June 1958

INVITATION NO.: CIVENG-19-016-58-95

Sealed bids in triplicate, subject to (1) the Terms and Conditions of the Invitation for Bids, (2) the attached Schedule, (3) General Provisions (Standard Form 32, October 1957 edition), which are incorporated herein by reference, and (4) such other contract provisions and specifications as are attached or incorporated by reference in the Schedule, will be received at the 4th Floor above office until 2:00 o'clock P. m. E.D.S.T. Time, 27 June 1958 (date) and at that time publicly opened Bid Opening Room 3rd Floor for furnishing the supplies or services described in the attached Schedule.

TITLE EVIDENCE, HAMPDEN AND WORCESTER COUNTIES, MASSACHUSETTS

General information and instructions to bidders are contained in the terms and conditions on the reverse hereof.

BID

DATE

In compliance with the above, the undersigned offers and agrees, if this Bid be accepted within _____ calendar days *(60 calendar days unless a different period be inserted by the bidder)* from the date of the opening, to furnish any or all of the items upon which prices are quoted, at the price set opposite each item, delivered at the designated point(s) within the time specified in the attached Schedule.

(1) Bidder represents that it ( ) is, ( ) is not, a small business concern. For this purpose, a small business concern is a concern that (1) is not dominant in its field of operation and, with its affiliates, employs fewer than 500 employees, or (2) is certified as a small business concern by the Small Business Administration. (See Code of Federal Regulations, Title 13, Chapter II, Part 103, 21 Federal Regulation 9709, which contains the detailed definition and related procedures.) Bidder represents that it ( ) has, ( ) has not, previously been denied a small business certificate by the Small Business Administration. If bidder is a regular dealer, it also represents that all supplies to be furnished hereunder ( ) will, ( ) will not, be manufactured or produced by a small business concern.
(2) That he is a ( ) regular dealer in, ( ) manufacturer of, the supplies bid upon.
(3) *(a)* That he ( ) has, ( ) has not, employed or retained any company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and *(b)* that he ( ) has, ( ) has not, paid or agreed to pay to any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to *(a)* and *(b)* above as requested by the contracting officer. *(For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Part 150.)*

FULL NAME OF BIDDER *(Type or print)*

BUSINESS ADDRESS OF BIDDER *(Street, city, zone, and State. Type or print)*

(See Paragraph 6 of Instructions to Bidders)

TELEPHONE NO.

SIGNATURE OF PERSON AUTHORIZED TO SIGN BID

TYPE OF BUSINESS *(Check appropriate box)*

☐ Individual ☐ Partnership ☐ Corporation

INCORPORATED IN THE STATE OF *(Complete, if corporation)*

TYPE OR PRINT SIGNER'S NAME AND TITLE

TERMS AND CONDITIONS OF THE INVITATION FOR BIDS

1. PREPARATION OF BIDS.—(*a*) Bidders are expected to examine the drawings, specifications, Schedule, and all instructions. Failure to do so will be at the bidder's risk.

(*b*) Each bidder shall furnish the information required by the bid form. The bidder shall print or type his name on the Schedule and each Continuation Sheet thereof on which he makes an entry. Erasures or other changes must be initialed by the person signing the bid. Bids signed by an agent must be accompanied by evidence of his authority.

(*c*) Unit price for each unit bid on shall be shown and such price shall include packing unless otherwise specified. A total shall be entered in the Amount column of the Schedule for each item bid on. In case of error in extension of price, the unit price will govern.

(*d*) Alternate bids will not be considered unless authorized by the Invitation.

(*e*) When not otherwise specified, bidder must definitely state time of proposed delivery.

(*f*) Time, if stated as a number of days, will include Sundays and holidays.

2. SUBMISSION OF BIDS.—(*a*) Bids and modifications thereof shall be enclosed in sealed envelopes addressed to the issuing office, with the name and address of the bidder, the date and hour of opening, and the invitation number on the face of the envelope. Telegraphic bids will not be considered unless authorized by the Invitation; however, bids may be modified by telegraphic notice provided such notice is received prior to the time set for the opening of the bids.

(*b*) Samples of items, when required, must be submitted within the time specified, and unless otherwise specified by the Government, at no expense to the Government. If not destroyed by testing, samples will be returned at bidder's request and expense, unless otherwise specified by the Invitation.

(*c*) In the event no bid is to be submitted, do not return the Invitation unless otherwise specified. However, a letter or post card should be sent to the issuing office advising whether future Invitations for the type of supplies or services covered by this Invitation are desired.

3. WITHDRAWAL OF BIDS.—Bids may be withdrawn by written or telegraphic notice (see 4 below).

4. LATE BIDS.—Bids and modifications or withdrawals thereof received after the time set for opening will not be considered, unless they are received before the award is made, and it is determined by the Government that failure to arrive on time was due solely to delay in the mails for which the bidder was not responsible.

5. GOVERNMENT-FURNISHED PROPERTY.—No material, labor, or facilities will be furnished by the Government unless otherwise provided for in the Invitation.

6. LABOR INFORMATION.—Attention is invited to the possibility that wage determinations may have been made under the Walsh-Healey Public Contracts Act providing minimum wages for employees engaged in the manufacture for sale to the Government of the supplies covered by this Invitation for Bids. Information in this connection, as well as general information as to the requirements of the Act concerning overtime payment, child labor, safety and health provisions, etc., may be obtained from the Wage and Hour and Public Contracts Divisions, Department of Labor, Washington 25, D. C. Requests for information should state the Invitation number, the issuing agency and the supplies covered.

7. DISCOUNTS.—(*a*) Prompt-payment discounts will be included in the evaluation of bids, provided the period of the offered discount is sufficient to permit payment within such period in the regular course of business under the delivery, inspection, and payment provisions of the Invitation and Bid.

(*b*) In connection with any discount offered, time will be computed from date of delivery of the supplies to carrier when delivery and acceptance are at point of origin, or from date of delivery at destination or port of embarkation when delivery and acceptance are at either of those points, or from date correct invoice or voucher (properly certified by the Contractor) is received in the office specified by the Government if the latter date is later than the date of delivery. Payment is deemed to be made, for the purpose of earning the discount, on the date of mailing of the Government check.

8. AWARD OF CONTRACT.—(*a*) The contract will be awarded to that responsible bidder whose bid, conforming to the Invitation for Bids, will be most advantageous to the Government, price and other factors considered.

(*b*) The Government reserves the right to reject any or all bids and to waive informalities and minor irregularities in bids received.

(*c*) The Government may accept any item or group of items of any bid, unless the bidder qualifies his bid by specific limitations. UNLESS OTHERWISE PROVIDED IN THE SCHEDULE, BIDS MAY BE SUBMITTED FOR ANY QUANTITIES LESS THAN THOSE SPECIFIED; AND THE GOVERNMENT RESERVES THE RIGHT TO MAKE AN AWARD ON ANY ITEM FOR A QUANTITY LESS THAN THE QUANTITY BID UPON AT THE UNIT PRICES OFFERED UNLESS THE BIDDER SPECIFIES OTHERWISE IN HIS BID.

(*d*) A written award mailed (or otherwise furnished) to the successful bidder within the time for acceptance specified in the bid results in a binding contract without further action by either party.

9. SELLER'S INVOICES.—Invoices shall be prepared and submitted in quadruplicate unless otherwise specified. Invoices shall contain the following information: Contract and order number (if any), item numbers, description of supplies or services, sizes, quantities, unit prices, and extended totals. Bill of lading number and weight of shipment will be shown for shipments made on Government bills of lading. The following certificate, signed by the Contractor or his authorized representative, will be shown on the original of the invoice:

"I certify that the above bill is correct and just and that payment therefor has not been received."

When the invoice is signed in the name of a company or corporation, the name of the person signing and the capacity in which he signs must appear. For example: "John Doe Company, by John Smith, Secretary," "Treasurer," or as the case may be.

Reverse of Standard Forms 30 and 33
June 1955 Edition

U. S. GOVERNMENT PRINTING OFFICE: 1955—O-363349

Standard Form 31
Prescribed by General Services
Administration, Nov. 1949 Edition

SCHEDULE
(SUPPLY CONTRACT)

PAGE NO. 1 | NUMBER OF PAGES OF SCHEDULE 1

REQUISITION NUMBER OR OTHER PURCHASE AUTHORITY: I.R. NO. 96 TA-914

INVITATION NO.: CIVENG-19-016-58-95

ACCOUNTING AND APPROPRIATION DATA

96X3122 Construction General, East Brimfield Dam & Reservoir
CC: 01.23

This procurement is authorized by 10 U. S. C. 2304.

The supplies or services to be furnished, the specifications, the discounts, the time and place of delivery, and any other special terms and conditions applicable to the Invitation for Bids, are set forth below.

DISCOUNTS WILL BE ALLOWED BY BIDDER FOR PROMPT PAYMENT AS FOLLOWS:

_____ PERCENT, 10 CALENDAR DAYS: _____ PERCENT, 20 CALENDAR DAYS: _____ PERCENT, 30 CALENDAR DAYS.

ITEM NO.	SUPPLIES OR SERVICES	QUANTITY (Number of Units)	UNIT	UNIT PRICE	AMOUNT
	TITLE EVIDENCE FOR LAND IN THE VICINITY OF EAST BRIMFIELD DAM AND RESERVOIR PROJECT, COUNTIES OF HAMPDEN AND WORCESTER, MASSACHUSETTS, covering the land outlined in red crayon on Drawing No. NED-PA 1363 and in accordance with attached SPECIFICATIONS entitled, "Specifications for Furnishing and Delivering Certificates of Title".				
1.	Preliminary Certificates of Title carrying liability per ownerships up to and including $3,000. (See SPECIFICATIONS SECTION II, Detailed Specifications, paragraph 14.)	Estimated 100	Cert.	$	$
2.	Continuations (Intermediate, Final and/or Post Final) of Certificates of Title prepared under Item No. 1	100	Cert.	$	$
	TOTAL ITEMS 1 and 2				$
	The attention of all bidders is directed to the sheet entitled INSTRUCTIONS TO BIDDERS, Article 4, "Method of Award" and to SECTION I, GENERAL SPECIFICATIONS, page 1, Article 2 entitled AREA AND QUANTITIES.				
	RECEIPT IS HEREBY ACKNOWLEDGED OF ADDENDA NOS. _____ Bidder: Enter Nos. or word "None"				

NAME OF BIDDER

Standard Form 31
Nov. 1949 Edition

TITLE EVIDENCE
HAMPDEN AND WORCESTER COUNTIES
MASSACHUSETTS

INVITATION NO. CIVENG-19-016-58-95

INSTRUCTIONS TO BIDDERS

1. SUBMISSION OF BIDS. a. Bids, if submitted in person or by messenger, shall be delivered to the Bid Receiving Desk (so identified) 4th Floor, Procurement Branch, U. S. Army Engineer Division, New England, Corps of Engineers, 150 Causeway Street, Boston 14, Massachusetts, prior to the time fixed for opening of bids. (Bidders who attend the bid opening may deliver bids directly to the Contracting Officer in the Bid Opening Room.)

b. Bids will be publicly opened at the appointed time in the Bid Opening Room, 3rd Floor of this office.

c. In the event that a metering device is used in stamping an envelope placed in the mail there shall be noted on said envelope the following: "POSTMASTER PLEASE CANCEL". The time as shown by the Post Office cancellation will be the only evidence considered as to the hour and date of posting.

2. BIDDERS' QUALIFICATIONS. Award will not be made to any bidder who is not acceptable to the Attorney General of the United States for performance of work of the type covered by this Invitation. (See paragraph 1 of Section II, Detailed Specifications.) In the event that an apparent low bidder under the Invitation for Bids is not qualified to issue certificates of title in the state in which land is located, a maximum period of 15 days, if time permits, may be allowed at the discretion of the Contracting Officer for the bidder to become qualified. In the event such bidder is unable to become qualified, his bid will be considered to be unresponsive to the Invitation for Bids and award will be made to the next lowest acceptable bidder. As time is of the essence, the ability of bidders to comply with the delivery requirements set forth in the attached specifications will be a decisive factor in making awards; i.e., award will not be made to any bidder who is not in a position to fully meet such delivery requirements.

3. ADDITIONAL LIABILITY. Attention of all prospective bidders is invited to SPECIFICATIONS, SECTION I, Paragraph 6, "METHOD OF PAYMENT". This paragraph specifically sets forth a predetermined fixed rate of payment which shall apply for additional liability.

4. METHOD OF AWARD. Award will be made to the lowest responsible bidder for the total of items 1 and 2. Bids shall be based upon furnishing title evidence for all items and complying with all requirements of the specifications. Bids based upon furnishing title evidence other than in strict accordance with the items as outlined in the Invitation will be considered to be unresponsive and will not be considered for award. (For example, bids based on a rate schedule furnished by the bidder in lieu of quoting prices under the items set forth in the Invitation will be rejected as unresponsive.)

5. BID INFORMATION. Bids must set forth full accurate and complete information as required by this Invitation for Bids (including attachments). The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001.

6. AGENTS. Bids signed by an agent must be made in the name of the Principal and must be accompanied by evidence of said agent's authority to act on behalf of his principal.

TITLE EVIDENCE
HAMPDEN AND WORCESTER COUNTIES
MASSACHUSETTS

INVITATION NO. CIVENG-19-016-58-95

TABLE OF CONTENTS

The sheets and sections comprising the complete Invitation for Bids are as follows:

Invitation and Bid (Supply Contract) Standard Form 30

Schedule (Supply Contract) Standard Form 31

Instructions to Bidders*

Table of Contents

Specifications for Furnishing and Delivering Certificates of Title.

General Provisions (Supply Contract) Standard Form 32, October 1957 Edition.

Supplement to General Provisions (X-14)

Addenda, as may be issued prior to the opening of bids.

*INSTRUCTIONS TO BIDDERS are for bidding information only and will not form a part of any resultant contract.

SPECIFICATIONS

for

Furnishing and Delivering Certificates of Title for Land Acquisition in Connection with East Brimfield Dam and Reservoir Project, HAMPDEN AND WORCESTER COUNTIES, MASSACHUSETTS.

SECTION 1
GENERAL SPECIFICATIONS

1. WORK TO BE DONE:

Certificates of title meeting the requirements in these specifications shall be prepared, executed, and delivered in triplicate as ordered by an authorized representative of the Government, to Real Estate Division, New England Division, Corps of Engineers, 150 Causeway Street, Boston 14, Massachusetts for approximately one hundred (100) tracts of land (ownership) in HAMPDEN AND WORCESTER COUNTIES, MASSACHUSETTS.

2. AREA AND QUANTITIES:

It is understood that the area of the project is subject to change or correction by reason of deletions from or additions to lands in the project and the Contracting Officer may reduce or increase the total number of certificates of title to be ordered and delivered. The Government does not guarantee that the quantities set forth in the schedule will be ordered or that they will not be exceeded, and the Government shall not be obligated to order any minimum quantity or restricted to any maximum quantity under any item. No additional payments over and above the contract unit prices, will be made to the Contractor because of variations between the estimated quantities and quantities actually ordered by the Government. It is the intent of the Government to procure hereunder all title evidence for the land outlined in red on the drawing and/or drawings herein mentioned during the period covered by means of certificates of title. However, the Government specifically reserves the right to procure title evidence from other sources, in lieu of certificates of title, in any or all cases where such procedure is determined by the Contracting Officer to be more advantageous to the Government.

3. DELIVERY:

Certificates of title shall be completed and actually delivered to the party designated in the order. Deliveries shall be made in the order requested and at the rate of not less than 8 certificates of title per week during the first six months the contract is in force and thereafter at the rate of not less than 12 per week, provided orders for not less than that number are received weekly. The first delivery shall be made within 10 days from the date of the first order.

4. OWNERSHIP:

One certificate of title will be ordered for each contiguous area of land in identical ownership, and land will be deemed contiguous even though portions thereof are separated by roads, railroad rights of way, streams, county lines, etc. Unless otherwise specified in the order, the certificate of title shall cover the entire ownership of the tract, and if certain estates or subsurface interests are vested in others than the owner or owners of the surface, the certificate of title shall cover such outstanding estates or interests.

5. MINOR MODIFICATIONS:

The Contracting Officer or his duly authorized representative reserves the right to make such minor changes in the work to be done under the specifications as in his judgment may be necessary or expedient to carry out the intent of the contract, provided that the cost to the contractor of doing the work shall not be increased thereby. No increase in the contract price will be paid the contractor for such minor modifications.

6. METHOD OF PAYMENT:

a. Payment to the Contractor for acceptable preliminary certificates and for continuations of certificates of titles actually ordered will be made at the unit prices established in the Schedule Payment for additional liability (over $3,000.00), wherever specifically ordered shall be made at the rate of $3.00 per thousand dollars of such additional liability.

b. Separate invoices on Standard Form 1035, setting forth tract numbers and names of landowners will be attached to vouchers. Standard Form 1034 must be properly certified and submitted monthly in duplicate for preliminary certificates of title and continuation certificates delivered and accepted during the preceding month. The

invoices or Standard Form 1035, when used, must itemize the charges for preliminary certificates of title, for continuations, and the proper premiums for additional liability as ordered.

c. The voucher, Standard Form 1034, or the original of each invoice must bear the following certificate signed by the contractor: "I certify that the above amount is correct and just and that payment therefor has not been received."

7. PRIMARY PERIOD OF CONTRACT AND EXTENSIONS:

a. The proposed agreement of which these specifications will form a part shall be in full force and effect from the date of award by the Contracting Officer up to and including 30 June 1958; but unless previously terminated, may at the election of the Contracting Officer or his duly authorized representative be extended from year to year until 30 June 1962 by notice of such election in writing to the Contractor at any time before the expiration of the current period.

b. The period of contract and extensions thereof shall mean the period in which the Government may order title evidence, and the title evidence ordered by the Government within the contract period or extensions thereof shall be furnished by the Contractor under this contract even though delivery will necessarily take place beyond the contract period or extensions thereof.

8. ORDERS:

Title evidence to be furnished under this contract shall be delivered when ordered by the Contracting Officer or his duly authorized representative on a form similar to ENG Form 1011-R, entitled "ORDER FOR TITLE EVIDENCE."

SECTION II

DETAILED SPECIFICATIONS

1. The contractor represents and it is a condition of any obligation of the Government to the contractor, that the corporation which is to issue certificates of title hereunder is authorized and qualified to issue certificates of title in the state where the land is located, and if the contractor is an attorney or abstracter, that the certificates of title to be furnished hereunder are certificates of title issued by a corporation authorized and qualified to issue certificates of title in the state where the land is situated, in which case the bid must be accompanied by a written commitment of such corporation to issue the certificates of title ordered hereunder.

2. Certificates of title will be based on a thorough search of all records affecting the title to the land and be unqualified as to the period of search unless otherwise specified.

3. a. The certificate of title must disclose the name of each person and address as disclosed by the public records in whom title is vested of record. Where subsurface estates or interests in the property to be acquired are owned by persons other than the owners of the fee title, the present record ownership of each such outstanding estate or interest and all pertinent data of record relating thereto shall be shown in the certificate of title unless otherwise specified in the order.

b. The preliminary certificate of title shall contain a statement of the names and addresses as disclosed by the public records of persons having any liens on or rights or interests in the property described in Schedule "A" of the certificate in order that they may be joined as parties defendent in a condemnation proceeding, if necessary.

4. Each certificate of title shall be executed and submitted in triplicate on legal size paper when practicable. The certificates shall conform substantially to the two (2) page form attached hereto marked ENG Form 903-R, except that final certificates of title for easements, showing title vested in the United States shall conform substantially to the two page form attached hereto marked ENG Form 1017-R.

5. Each certificate of title must certify to a thorough search of the title to the property described in Schedule "A", must contain a statement certifying or guaranteeing its contents and accuracy; and must show the ownership and condition of the title to the property and such additional information as may be deemed necessary by the contracting officer to reflect the true status of the title of the present record owner or owners.

6. The description of the captioned land shall be set forth in Schedule "A" and shall be immediately followed by a reference to the source of title of the present owner.

7. Schedule "B" must disclose all essential information on matters affecting the title which are set up in the Schedule as exceptions or objections to the title. Schedule "B" shall not set forth exceptions or objections in general terms or by reference to deeds, instruments, plans, proceedings or other matters of record, without including copies or a sufficient abstract or digest of the provisions of the instruments or the proceedings or other matters of record creating or imposing the rights, interests or encumbrances mentioned in Schedule "B", to enable an attorney examining the certificate to determine the nature and extent of such matters, and their effect on the validity of the title to the land described in Schedule "A".

8. a. If Schedule "B" contains any exceptions or objections with respect to liens of taxes, assessments or bonds of a special improvement district, such exceptions or objections should be followed by references to the statutes pursuant to which the special improvement district was organized, its taxes and assessments levied and its bonds issued and any other facts necessary to enable an attorney examining the certificate to determine the nature and extent of the lien, if any, created by such taxes, assessments or bonds, on the land described in Schedule "A".

b. The preliminary certificate of title must have attached thereto a plat or plan sufficient to enable the examining attorney to identify the land depicted on the plat or plan with the land described in the caption. Rights-of-way on or over the land being acquired must be shown and successive diminishing tracts decreasing a larger captioned area will be clearly delineated on the plat or plan.

9. When certificates of title show title in a record owner who is deceased, they must state or be accompanied by a letter stating whether a judicial proceeding, affidavits of heirship, or other form of proof will be acceptable to the title company as the basis for the issuance of a certificate showing title vested in the persons shown by such evidence to be the heirs of the deceased.

10. If the certificate of title shows record title in a state, county, municipality, or other subdivision of a state, or in corporation, or in a church, or other religious, educational, or charitable institution or organization, or in a person or persons acting in a fiduciary or similar capacity, without authority to convey the property in the absence of specific authorization, the certificate of title shall disclose the incapacity or limitation on the authority of such record owner to convey the property and shall specify what action is necessary to enable such record owner to make a valid conveyance to the United States and what proof thereof will be required by the title company before issuing a final certificate of title showing valid title vested in the United States.

11. Certificates of title containing any exception or objection with respect to rights or possible rights under the Soldiers' and Sailors' Civil Relief Act of 1918 (40 Stat. C.20) as extended by Section 4 of the Joint Resolution approved August 27, 1940, and by the provisions of Section 13 of the Selective Training and Service Act of 1940, or to rights under the Soldiers' and Sailors' Civil Relief Act of 1940 (54 Stat. 1178) and the Soldiers' and Sailors' Civil Relief Act Amendments of 1942 (Public Law 732 H.R. 7164), or any amendments thereto must:

a. Name each person who may have such rights, and give address of any such person if shown in the proceeding affecting such right;

b. Contain or be accompanied by a statement of the company issuing the certificate, showing the nature and extent of the interest in the land of each such person, and

c. If any such person has an actual interest in the land contain or be accompanied by a transcript of the proceeding giving rise to such rights and disclose the action, if any, taken in the proceeding to comply with the requirements of said Acts.

12. The company issuing the certificates of title to be furnished pursuant to the terms of these specifications agrees to pass upon the sufficiency of curative material obtained by representatives of the United States to eliminate objections disclosed in Schedule "B" of the preliminary certificates of title issued hereunder and, when such curative material is acceptable, to eliminate objections covered thereby and omit such objections from the final certificates to be issued by it. The company also agrees to pass upon the proposed deed of the property to the United States and the sufficiency of the deed to vest in the United States valid title to the property described in Schedule "A" of the preliminary certificate. For these purposes the company shall designate a local representative authorized by it to pass upon the form a sufficiency of such curative material, to waive objections in the preliminary certificates and to approve the proposed deed to the United States.

13. Each certificate of title shall contain a recital under an item designated "Taxes", reading as follows:

> ALL TAXES INCLUDING ANY SPECIAL ASSESSMENTS AGAINST THE FOREGOING LAND, UP TO AND INCLUDING THE YEAR _____, HAVE BEEN PAID, EXCEPT AS FOLLOWS:
>
> (An itemized statement of all taxes and assessments constituting liens shall be inserted)

14. The certificates to title shall limit the liability of the title company to a sum equal to 50% of the monetary consideration to be paid by the United States, and in case of land being acquired by donation or exchange, to a sum equal to 50% of the value of the land as determined by the United States, except, as to acquisition involving a monetary consideration to be paid by the United States of more than $50,000.00, the limitation of liability of the issuing title company under the certificate of title shall be limited to 50 percent of the first $50,000.00 and 25 percent of that portion of the consideration in excess of the first $50,000.00.

15. Upon order of the contracting officer or his duly authorized representative, the examination of the title to land for which a preliminary certificate has already been issued will be extended and an intermediate certificate of title will be issued. When conveyance to the United States is perfected, the examination of the title will be extended through the time of recordation of the deed to the United States and a final certificate will be issued showing a valid title in the United States, free and clear of all liens, encumbrances and defects which have not been specifically waived by the United States.

CERTIFICATE OF TITLE

_____
(Name of Title Company)

_____
(Address)

TO (_____ and) the UNITED STATES OF AMERICA:

The _____, a Corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ State of _____, hereby certified that it has made a thorough search of the title to the property described in SCHEDULE "A" hereof, beginning with the _____ day of _____ 19__, and that the title to said property was indefeasibly vested of record in _____ as of the _____ day of _____ 19___, free and clear of all encumbrances, defects, interests and all other matters whatsoever, either of record or otherwise known to the Corporation, impairing or adversely affecting the title to said property, except as shown in SCHEDULE "B" hereof.

The maximum liability of the undersigned under this certificate is limited to the sum of _____.

In consideration of the premium paid, this certificate is issued for the use and benefit of (said _____ and) the UNITED STATES OF AMERICA (and each of them).

IN WITNESS WHEREOF, said Corporation has caused these presents to be signed in its name and behalf, sealed with its corporate seal, and delivered by its proper officers thereunto duly authorized, as of the date last above mentioned.

Attest:

_____
Name of Corporation

_____ By: _____
(Title of Attesting Officer) (Title of Executing Officer)

ENG Form 903-R

SCHEDULE "A"

The property covered by this certificate is accurately and fully described as follows:

SCHEDULE "B"

The property described in SCHEDULE "A" hereof is free and clear from all interests, encumbrances, and defects of title and all other matters whatsoever of record, or which though not of record, are known to this Corporation to exist impairing or adversely affecting the title to said property, except the following:

1. All taxes, including any special assessments against the foregoing land, up to and including the year _____, have been paid, except as follows: _____

_____

(An itemized statement of all taxes and assessments constituting liens shall be inserted.)

FINAL CERTIFICATE OF TITLE

FOR EASEMENTS

Name of Title Company

Address

TO _____ and the UNITED STATES OF AMERICA:

The _____, A Corporation organized and existing under the laws of the State of _____ with its principal office in the City of _____ hereby certifies that it has made a thorough search of the title to the property described in SCHEDULE "A" hereof, and that valid title to a perpetual easement for _____ in said property was indefeasibly vested of record in the UNITED STATES OF AMERICA as of _____, free and clear of all encumbrances, defects, interests, and all other matters whatsoever, either of record or otherwise known to the corporation impairing or adversely affecting the title to said property, except as shown in SCHEDULE "B" hereof.

Maximum liability of the undersigned under this certificate is limited to the sum of $_____.

In consideration of the premium paid, this certificate is issued for the use and benefit of (said _____ and) the UNITED STATES OF AMERICA, (and each of them).

IN WITNESS WHEREOF, said Corporation has caused these presents to be signed in its name and behalf, sealed with its corporate seal, and delivered by its proper officers thereunto duly authorized, as of the date last above mentioned.

Attest: _____
(Name of Corporation)

_____ By: _____
(Title of Attesting Officer) (Title of Executing Officer)

ENG Form 1017-R

NAME OF TITLE COMPANY

SCHEDULE "A"

The property covered by this certificate is accurately and fully described as follows:

The aforesaid easement is more particularly described in a deed dated _____ from _____ to the United States, of record in Volume _____, page _____, of the records of aforesaid county.

NAME OF TITLE COMPANY

SCHEDULE "B"

The easement in or over the property described in SCHEDULE "A" hereof is free and clear from all interests, encumbrances, and defects ot title and all other matters whatsoever of record, or which, though not of record, are known to this Corporation to exist impairing or adversely affecting the title of said property, except as following:

SUPPLEMENT TO GENERAL PROVISIONS (SUPPLY CONTRACT) S. F. FORM 32, OCTOBER 1957 EDITION

I. Clause 11 Default - The following subparagraph (g) is added:

(g) The Government will take no action pursuant to this clause, to terminate the right of the Contractor to proceed where the failure of the Contractor to make delivery of the supplies or to perform the services within the time specified elsewhere in this contract is due solely to the operation of the priorities and allocations system and is not otherwise caused by the fault or negligence of the Contractor. It is understood and agreed that such delays will be considered as due to an act of the Government, and, as such, will be excusable within the meaning of subparagraph (b) of this clause, and the Contractor will not be liable for any excess costs or damages occasioned thereby.

II. The following clauses are added:

22. RENEGOTIATION.

(a) To the extent required by law, this contract is subject to the Renegotiation Act of 1951 (P.L. 9, 82d Cong., 65 Stat. 7) as amended (P.L. 764, 83d Cong., 68 Stat. 1116; P.L. 216, 84th Cong., 69 Stat. 447), and to any subsequent act of Congress providing for the renegotiation of contracts. Nothing contained in this clause shall impose any renegotiation obligation with respect to this contract or any subcontract hereunder which is not imposed by an act of Congress heretofore or hereafter enacted. Subject to the foregoing this contract shall be deemed to contain all the provisions required by Section 104 of the Renegotiation Act of 1951, and by any such other act, without subsequent contract amendment specifically incorporating such provisions.

(b) The Contractor agrees to insert the provisions of this clause, including this paragraph (b), in all subcontracts, as that term is defined in section 103g of the Renegotiation Act of 1951 or any subsequent act of Congress providing for the renegotiation of contracts.

23. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT.

/The provisions of this clause shall be applicable only if the amount of this contract is in excess of $1,000./

(a) The performance of work under this contract may be terminated by the Government in accordance with this clause in whole, or from time to time in part, whenever the Contracting Officer shall determine such termination is in the best interests of the Government. Any such termination shall be effected by delivery to the Contractor of a Notice of Termination specifying the extent to which performance or work under the contract is terminated, and the date upon which such termination becomes effective.

(b) After receipt of a Notice of Termination, and except as otherwise directed by the Contracting Officer, the Contractor shall (1) stop work under the contract on the date and to the extent specified in the Notice of Termination; (2) place no further orders or subcontracts for material, services, or facilities except as may be necessary for completion of such portion of the work under the contract as is not terminated; (3) terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the Notice of Termination; (4) assign to the Government, in the manner, at the times, and to the extent directed by the Contracting Officer, all of the right, title, and interest of the Contractor under the orders and subcontracts so terminated, in which case the Government shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts; (5) settle all outstanding liabilities and all claims arising out of such termination of orders and subcontracts, with the approval or ratification of the Contracting Officer, to the extent he may require, which approval or ratification shall be final for all the purposes of this clause, (6) transfer title and deliver to the Government, in the manner, at the times, and to the extent, if any, directed by the Contracting Officer, (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced as a part of, or acquired in connection with the performance of, the work terminated by the Notice of Termination, and (ii) the completed or partially completed plans, drawings, information, and other property which, if the contract had been completed, would have been required to be furnished to the Government; (7) use its best efforts to sell, in the manner, at the times, to the extent, and at the price or prices directed or authorized by the Contracting Officer, any property of the types referred to in provision (6) of this paragraph, provided, however, that the Contractor (i) shall not be required to extend credit to any purchaser, and (ii) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Contracting Officer; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Government to the Contractor under this contract or shall otherwise be credited to the price or cost of the work covered by this contract or paid in such other manner as the Contracting Officer may direct; (8) complete performance of such part of the work as shall not have been terminated by the Notice of Termination; and (9) take such action as may be necessary, or as the Contracting Officer may direct, for the protection and preservation of the property related to this contract which is in the possession of the Contractor and in which the Government has or may acquire an interest. At any time after expiration of the plant clearance period, as defined in Section VIII, Armed Services Procurement Regulations, as it may be amended from time to time, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of any or all items of termination. Inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by the Contracting Officer, and may request the Government to remove such items or enter into a storage agreement covering them. Not later than fifteen (15) days thereafter, the Government will accept title to such items and remove them or enter into a storage agreement covering the same, provided that the list submitted shall be subject to verification by the Contracting Officer upon removal of the items, or if the items are stored, within forty-five (45) days from the date of submission of the list, and any necessary adjustment to correct the list as submitted shall be made prior to final settlement.

(c) After receipt of a Notice of Termination, the Contractor shall submit to the Contracting Officer its termination claim, in the form and with the certification prescribed by the Contracting Officer. Such claim shall be submitted promptly but in no event later than two years from the effective date of termination, unless one

C 429

ARMY-NED-BOSTON

or more extensions in writing are granted by the Contracting Officer, upon request of the Contractor made in writing within such two-year period or authorized extension thereof. However, if the Contracting Officer determines that the facts justify such action, he may receive and act upon any such termination claim at any time after such two-year period or any extension thereof. Upon failure of the Contractor to submit its termination claim within the time allowed, the Contracting Officer may determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall thereupon pay to the Contractor the amount so determined.

(d) Subject to the provisions of paragraph (c), the Contractor and the Contracting Officer may agree upon the whole or any part of the amount or amounts to be paid to the Contractor by reasons of the total or partial termination of work pursuant to this clause, which amount or amounts may include a reasonable allowance for profit on work done. The contract shall be amended accordingly, and the Contractor shall be paid the agreed amount. Nothing in paragraph (e) of this clause, prescribing the amount to be paid to the Contractor in the event of failure of the Contractor and the Contracting Officer to agree upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, shall be deemed to limit, restrict, or otherwise determine or affect the amount or amounts which may be agreed upon to be paid to the Contractor pursuant to this paragraph (d).

(e) In the event of the failure of the Contractor and the Contracting Officer to agree as provided in paragraph (d) upon the whole amount to be paid to the Contractor by reason of the termination of work pursuant to this clause, the Contracting Officer shall determine, on the basis of information available to him, the amount, if any, due to the Contractor by reason of the termination and shall pay to the Contractor the amounts determined as follow:

(1) For completed supplies accepted by the Government (or sold or acquired as provided in paragraph (b) (7) above) and not theretofore paid for, a sum equivalent to the aggregate price for such supplies computed in accordance with the price or prices specified in the contract, appropriately adjusted for any saving or freight or other charges;

(2) The total of —

(i) the costs incurred in the performance of the work terminated, including initial costs and preparatory expense allocable thereto, but exclusive of any costs attributable to supplies paid or to be paid for under paragraph (e) (1) hereof;

(ii) the cost of settling and paying claims arising out of the termination of work under subcontracts or orders, as provided in paragraph (b)(5) above, which are properly chargeable to the terminated portion of the contract (exclusive of amounts paid or payable on account of supplies or materials delivered or services furnished by subcontractors or vendors prior to the effective date of the Notice of Termination, which amounts shall be included in the costs payable under (i) above).

(iii) A sum equal to 2% of that part of the amount determined under (i) which represents the cost of articles and materials not processed by the Contractor, plus a sum equal to 8% of the remainder of such amount but the aggregate of such sums shall not exceed 6% of the whole of the amount determined under subdivision (i) above, which amount for the purpose of this subdivision (iii) shall exclude any charges for interest on borrowings; provided, however, that if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, no profit shall be included or allowed under this subdivision (iii) and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss.

(3) The reasonable costs of settlement, including accounting, legal, clerical, and other expenses reasonably necessary for the preparation of settlement claims and supporting data with respect to the terminated portion of the contract and for the termination and settlement of subcontracts thereunder, together with reasonable storage, transportation, and other costs incurred in connection with the protection or disposition of property allocable to this contract. The total sum to be paid to the Contractor under (1) and (2) of this paragraph (e) shall not exceed the total contract price as reduced by the amount of payments otherwise made and as further reduced by the contract price of work not terminated. Except for normal spoilage, and except to the extent that the Government shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor as provided in paragraph (e)(1) and paragraph (e)(2)(i), the fair value, as determined by the Contracting Officer, of property which is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government, or to a buyer pursuant to paragraph (b)(7).

(f) Any determination of costs under paragraph (c) or (e) hereof shall be governed by the Statement of Principles for Consideration of Costs set forth in Part 4 of Section VIII of the Armed Services Procurement Regulation, as in effect on the date of this contract.

(g) The Contractor shall have the right of appeal, under the clause of this contract entitled "Disputes", from any determination made by the Contracting Officer under paragraphs (c) or (e) above, except that if the Contractor has failed to submit its claim within the time provided in paragraph (c) above and has failed to request extension of such time, he shall have no such right of appeal. In any case where the Contracting Officer has made a determination of the amount due under paragraph (c) or (e) above, the Government shall pay to the Contractor the following: (i) If there is no right of appeal hereunder of if no timely appeal has been taken, the amount so determined by the Contracting Officer, or (ii) if an appeal has been taken, the amount finally determined on such appeal.

(h) In arriving at the amount due the Contractor under this clause there shall be deducted (1) all unliquidated advance or other unliquidated payments on account theretofore made to the Contractor, (2) any claim which the Government may have against the Contractor in connection with this contract, and (3) the agreed price for, or the proceeds of sale of, any materials, supplies, or other things acquired by the Contractor or sold, pursuant to the provisions of this clause, and not otherwise recovered by or credited to the Government.

(i) If the termination hereunder be partial, prior to the settlement of the terminated portion of this contract, the Contractor may file with the Contracting Officer a request in writing for an equitable adjustment of the price or prices specified in the contract relating to the continued portion of the contract (the portion not terminated by the Notice of Termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices.

(j) The Government may from time to time,

under such terms and conditions as it may prescribe, make partial payments and payments on account against costs incurred by the Contractor in connection with the terminated portion of this contract whenever in the opinion of the Contracting Officer the aggregate of such payments shall be within the amount to which the Contractor will be entitled hereunder. If the total of such payments is in excess of the amount finally agreed or determined to be due under this clause, such excess shall be payable by the Contractor to the Government upon demand, together with interest computed at the rate of 6% per annum, for the period from the date such excess payment is received by the Contractor to the date on which such excess is repaid to the Government; provided, however, that no interest shall be charged with respect to any such excess payment attributable to a reduction in the Contractor's claim by reason of retention or other disposition of termination inventory until 10 days after the date of such retention or disposition.

(k) Unless otherwise provided for in this contract, or by applicable statute, the Contractor, from the effective date of termination and for a period of six years after final settlement under this contract, shall preserve and make available to the Government at all reasonable times at the office of the Contractor but without direct charge to the Government, all its books, records, documents, and other evidence bearing on the costs and expenses of the Contractor under this contract and relating to the work terminated hereunder, or, to the extent approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions thereof.

24. AUTHORIZATION AND CONSENT.

The Government hereby gives its authorization and consent (without prejudice to its rights of indemnification, if such rights are provided for in this contract) for all use and manufacture, in the performance of this contract or any part hereof on any amendment hereto or any subcontract hereunder (including any lower-tier subcontract), of any patented invention (i) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract, or (ii) utilized in the machinery, tools, or methods the use of which necessarily results from compliance by the Contractor or the using subcontractor with (a) specifications or written provisions now or hereafter forming a part of this contract, or (b) specific written instructions given by the Contracting Officer directing the manner of performance. The Contractor's entire liability to the Government for patent infringement shall be determined solely by the provisions of the indemnity clause, if any, included in the contract and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

25. PATENT INDEMNITY (PREDETERMINED).

If the amount of this contract is in excess of $5,000, the Contractor shall indemnify the Government and its officers, agents, and employees against liability, including costs, for infringement of any United States letters patent (except letters patent issued upon an application which is now or may hereafter be kept secret or otherwise withheld from issue by order of the Government) arising out of the manufacture or delivery of supplies or out of construction, alteration, modification, or repair of real property (hereinafter referred to as "construction work") under this contract, or out of the use or disposal by or for the account of the Government of such supplies or construction work. The foregoing indemnity shall not apply unless the Contractor shall have been informed as soon as practicable by the Government of the suit or action alleging such infringement, and shall have been given such opportunity as is afforded by applicable laws, rules, or regulations to participate in the defense thereof; and further, such indemnity shall not apply if: (i) the infringement results from compliance with specific written instructions of the Contracting Officer directing a change in the supplies to be delivered or in the materials or equipment to be used, or directing a manner of performance of the contract not normally used by the Contractor; or (ii) the infringement results from the addition to, or change in, the supplies furnished or construction work performed, which addition or change was made subsequent to delivery or performance by the Contractor; or (iii) the claimed infringement is settled without the consent of the Contractor, unless required by final decree of a court of competent jurisdiction.

26. REPORTING OF ROYALTIES.

/The provisions of this clause shall be applicable only if the amount of the contract is in excess of $50,000./

(a) The Contractor shall report in writing (in quadruplicate) to the Contracting Officer as soon as practicable after execution of this contract whether or not any royalties in excess of $250 have been paid or are to be paid by the Contractor directly to any person or firm in connection with the performance of this contract. If royalties in excess of $250 have been paid or are to be paid to any person or firm, the report shall include the following items of information with respect to such royalties (including the initial $250):

(1) The name and address of each licensor to whom royalties in excess of $250 have been paid or are to be paid,

(2) The patent numbers, patent application serial numbers (with filing dates), or other identification of the basis for such royalties,

(3) The manner of computing the royalties consisting of (i) a brief identification of each royalty-bearing unit or process, (ii) the total amount of royalties, and (iii) the percentage rate or dollars and cents amount of royalties on each such unit or process; provided; that if the royalties cannot be computed in terms of units or dollars and cents value, then other data showing the manner in which the Contractor computes the royalties.

(b) In lieu of furnishing a report under paragraph (a), the Contractor may furnish a single, consolidated report for each accounting period of the Contractor during which the Contractor has contracts with the Government, provided the Contractor has requested and obtained the prior written approval of the Chief, Patents Division, Office of The Judge Advocate General. Such consolidated report shall be furnished, when the furnishing thereof has been approved, in the number of copies as approved, as soon as practicable after the close of the accounting period covered by the report. Such consolidated report shall be made in accordance with Contractor's established accounting practice and shall include for the accounting period the total amount of royalties accruing to each licensor at a rate in excess of $1,000 per annum on the Contractor's over-all business, together with (i) the name and address of each such licensor (ii) the patent numbers, patent application serial numbers (with filing dates), or other identification of the

basis for such royalties, (iii) a brief description of the subject matter of the license under which royalties are charged, (iv) the percentage rate or unit amount or if the royalties do not accrue by rate or unit amount, such other data showing the manner by which the royalties accrue to licensor, and (v) an estimate or approximation (without detailed accounting) of the portion of such royalties that may be attributable to Government contracts. The Contractor shall, if requested by the Government, furnish at Government expense a more detailed allocation of such royalty payments attributable to Government contracts.

(c) In the event that the Contractor requests written approval to furnish consolidated reports under paragraph (b) above, the Chief, Patents Division, Office of the Judge Advocate General, shall promptly consider the request and furnish to the Contractor a letter stating whether or not the request is approved and, notwithstanding any such approval, the Contracting Officer shall have the right to question any such subsequently furnished report as to accuracy or completeness of data and to ask for additional information. The Contractor shall furnish a copy of such letter of approval to the Contracting Officer administering this contract.

(d) After payment of eighty percent (80%) of the amount of this contract, as from time to time amended, further payment shall be withheld until a reserve of either (i) ten percent (10%) of such amount or (ii) $5,000, which ever is less, shall have been set aside, such reserve or the balance thereof to be retained until the Contractor shall have furnished to the Contracting Officer the report called for by paragraph (a) hereof or the copy of the letter approving the Contractor's request to furnish the report under paragraph (b); provided that no amount shall continue to be withheld from payment for the causes specified in this paragraph (d) if the Contracting Officer shall find that the Contractor has not been furnished a letter as required by paragraph (c) within a reasonable time after making written request to submit a single, consolidated report under the provisions of paragraph (b) of this clause; and provided further that the Contracting Officer may, in his discretion, order payment to be withheld in the amount and manner above provided if the report called for by paragraph (a) is unsatisfactory or if the Chief, Patents Division, Office of The Judge Advocate General, notifies the Contracting Officer that the report called for by paragraph (b) is due but has not been received, or if received, is found to be unsatisfactory. No amount shall be withheld under this paragraph when the minimum amount specified by this paragraph is being withheld under other provisions of this contract. The withholding of any amount or subsequent payment thereof to the Contractor shall not be construed as a waiver of any right accruing to the Government under this contract.

27. GRATUITIES.

(a) The Government, may, by written notice to the Contractor, terminate the right of the Contractor to proceed under this contract if it is found, after notice and hearing, by the Secretary or his duly authorized representative, that gratuities (in the form of entertainment, gifts or otherwise) were offered or given by the Contractor, or any agent or representative of the Contractor to any officer or employee of the Government with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending, or the making of any determination with respect to the performing of such contract; provided that the existence of the facts upon which the Secretary or his duly authorized representative makes such findings shall be in issue and may be reviewed in any competent court.

(b) In the event this contract is terminated as provided in paragraph (a) hereof, the Government shall be entitled (i) to pursue the same remedies against the Contractor as it could pursue in the event of a breach of the contract by the Contractor, and (ii) as a penalty in addition to any other damages to which it may be entitled by law, to exemplary damages in an amount (as determined by the Secretary or his duly authorized representative) which shall not be less than three not more than ten times the costs incurred by the Contractor in providing any such gratuities to any such officer or employee.

(c) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.

28. PRIORITIES, ALLOCATIONS AND ALLOTMENTS.

/The provisions of this clause shall be applicable only if this is a Military contract./

The Contractor agrees, in the procurement and use of materials required for the performance of this contract, to comply with the provisions of all applicable rules and regulations of the Business and Defense Services administration, including Defense Materials System regulations.

29. NOTICE TO THE GOVERNMENT OF LABOR DISPUTES.

Whenever the Contractor has knowledge that any actual labor dispute is delaying or threatens to delay the timely performance of this contract, the Contractor shall immediately give notice thereof, including all relevant information with respect thereto, to the Contracting Officer.

30. FEDERAL, STATE AND LOCAL TAXES.

(a) As used throughout this clause, the term "tax inclusive date" means the date of negotiated contracts and the date set for the opening of bids for contracts entered into through formal advertising. As to additional supplies or services procured by modification to this contract, the term "tax inclusive date" means the date of such modification.

(b) Except as may be otherwise provided in this contract, the contract price includes all Federal, State, and local taxes and duties in effect and applicable to this contract on the tax inclusive date, except taxes (other than Federal transportation taxes) from which the Government, the Contractor, or the transactions or property covered by this contract are then exempt. Unless specifically excluded, duties are included in the contract price, and, if freight is included in the contract price, Federal transportation taxes are likewise included.

(c) (1) If the Contractor is required to pay or bear the burden

(i) of any tax or duty, which either was not to be included in the contract price pursuant to the requirements of paragraph (b), or was specifically excluded from the contract price by a provision of the contract; or

(ii) of an increase in rate of any tax or duty, whether or not such tax or duty was excluded form the contract price; or of any interest or penalty thereon, the contract price shall be correspondingly increased; Provided that the Contractor warrants in writing

that no amount for such tax, duty, or rate increase was included in the contract price as a contingency reserve or otherwise; and Provided further that liability for such tax, duty, rate increase, interest or penalty was not incurred through the fault or negligence of the Contractor or its failure to follow instructions of the Contracting Officer.

(2) If the Contractor is not required to pay or bear the burden, or obtains a refund or drawback, in whole or in part, of any tax, duty, interest, or penalty which (i) was to be included in the contract price pursuant to the requirements of paragraph (b), (ii) was included in the contract price, or (iii) was the basis of an increase in the contract price, the contract price shall be correspondingly decreased or the amount of such relief, refund or drawback shall be paid to the Government, as directed by the Contracting Officer. The contract price shall be correspondingly decreased if the Contractor, through its fault or negligence or its failure to follow instructions of the Contracting Officer, is required to pay or bear the burden, or does not obtain a refund or drawback of any such tax, duty, interest, or penalty. Interest paid or credited to the Contractor incident to a refund of taxes shall inure to the benefit of the Government to the extent that such interest was earned after the Contractor was paid or reimbursed by the Government for such taxes.

(3) Invoices or vouchers covering any adjustment of the contract price pursuant to this paragraph (c) shall set forth the amount thereof as a separate item and shall identify the particular tax involved.

(4) Nothing in this paragraph (c) shall be applicable to the social security taxes; net income taxes; excess profit taxes; capital stock taxes; Federal transportation taxes; except changes in the rate thereof, including repeal, pertaining to shipments from the Contractor to the Government; unemployment compensation taxes; or any State and local taxes, except those levied on or measured by the contract or sales price of the services or completed supplies furnished under this contract, including gross income taxes, gross receipts taxes, sales and use taxes, excise taxes, or franchise or occupation taxes measured by sales or receipts from sales.

(5) No adjustment of less than $100 shall be made in the contract price pursuant to this paragraph.

(d) Unless there does not exist any reasonable basis to sustain an exemption, the Government agrees upon request of the Contractor, without further liability except as otherwise provided in this contract, to furnish evidence appropriate to establish exemption from (i) any Federal tax, which the Contractor warrants in writing was excluded from the contract price, or (ii) any State or local taxes; Provided that evidence appropriate to establish exemption from duties will be furnished, and Government bills of lading will be issued, only at the discretion of the Contracting Officer. In addition, the Contracting Officer may furnish evidence appropriate to establish exemption from any tax that may, pursuant to this clause, give rise to either an increase or decrease in the contract price.

(e) (1) The Contractor shall promptly notify the Contracting Officer of all matters pertaining to Federal, State and local taxes and duties that reasonably may result in either an increase or decrease in the contract price.

(2) Whenever an increase or decrease in the contract price may be required under this clause, the Contractor shall take action as directed by the Contracting Officer, and the contract price shall be equitably adjusted to cover the costs of such action, including any interest, penalty, and reasonable attorney's fees.

31. SUBCONTRACTING - SMALL BUSINESS AND/OR LABOR SURPLUS AREAS.

It is the policy of the Government to place supply contracts with suppliers who will perform such contracts substantially in areas of current labor surplus where this can be done, consistent with the efficient performance of the contract, at prices no higher than are obtainable elsewhere. The Contractor agrees to use its best efforts to place its subcontracts in accordance with this policy. In complying with the foregoing and with paragraph (b) of the clause of this contract entitled "Utilization of Small Business Concerns", the contractor in placing its subcontracts shall observe the following order of preference: (i) small business concerns in labor surplus areas; (ii) other concerns in labor surplus areas; (iii) small business concerns not in labor surplus areas.

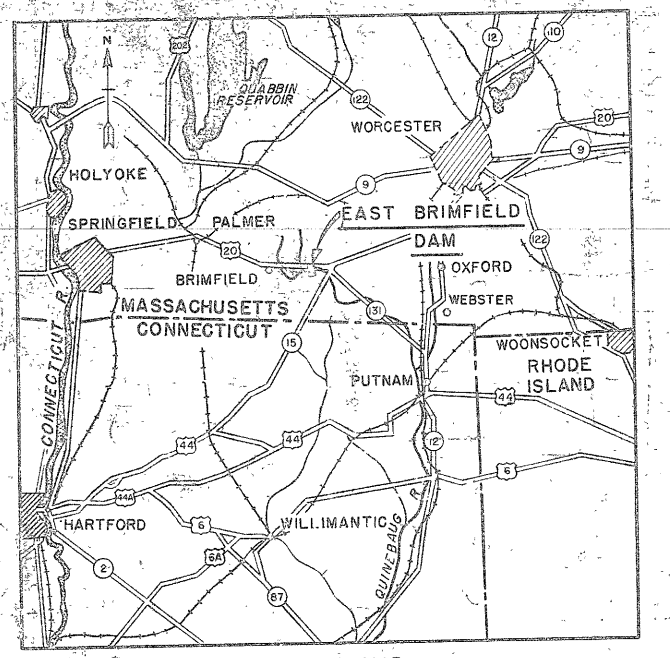
Brimfield (East) Dam Reservoir Map - 1950



1950 Reports

Brimfield (East) Dam Reservoir Map - October 1950 - Thames River Flood Control, Quinebaug River.

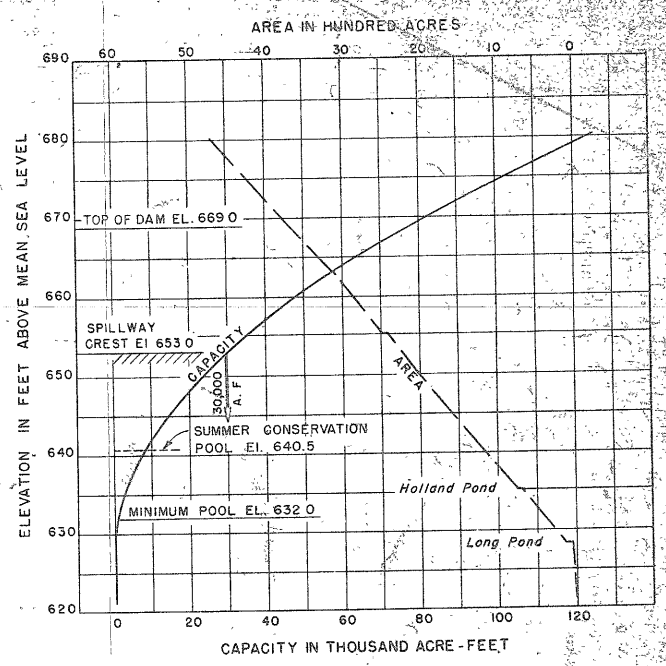
City/Town	Brimfield
Name	U S Army Corps of Engineers
Streets	Holland-Brimfield Road
Streets	East Brimfield Road
Streets	Brimfield Road
Streets	Wales Road
Streets	Route 19
Streets	Five Bridge Road
Streets	Route 20
Water	Long Pond
Water	Little Alum Pond
Water	Thames River
Water	Hamilton Reservoir
Water	Holland Pond
Water	Quinebaug River
Water	Lost Lake



VICINITY MAP

SCALE IN MILES

5 0 5 10



AREA AND CAPACITY CURVES

DRAINAGE AREA 67.5 SQ. MI.

LEGEND

- Existing numbered roads
- Existing paved highways
- Existing gravel roads
- Proposed highway relocation or improvement
- Reservoir at spillway crest
- Summer conservation pool El. 640.5

NOTES

Contour interval 10 feet.
Elevations refer to Mean Sea Level Datum.
Topography at damsite based on Plane Table Survey.
Remaining topography based on U.S.G.S. Map.

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS
U.S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION, BOSTON, MASS

DES BY	DR BY	CK BY
W.C.D.	D.C.O'R.	F.A.M.

ENGINEER
PROJECT ENGINEER
SUBMITTED BY
CHIEF, PLANN. & REPTS BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION

THAMES RIVER FLOOD CONTROL

EAST BRIMFIELD DAM

RESERVOIR MAP

QUINEBAUG RIVER MASSACHUSETTS

DATE OCT. 1956

APPROVED
COL., C.E., DIVISION ENGINEER

SCALE AS SHOWN | SPEC. NO.

DRAWING NUMBER TH-1-1239

SHEET 1 OF 2

PLATE NO.

Brimfield Dam Inspections - 1951 - 1956



1951 Reports

Inspections by Tighe & Bond.

City/Town	Brimfield
Dam	Smith Dam
Dam	Elliot Dam
Dam	Springfield Sportsmen's Dam
Dam	Dean Pond Dam
Dam	Moulton Dams
Dam	Paradise Pond Dams
Dam	Pierce Dam
Dam	Snell Dam
Dam	Humpage Dam
Dam	Kaplinger Dam
Dam	Springfield Boys Club Dam
Dam	Wheeler Dam
Dam	Dearth Hill Pond Dam
Dam	Woodman Pond Dam
Dam	Monette Dam
Dam	McAllister Dam
Dam	Cheney Dam

Dam	Morgan Dams
Dam	Maple Lake Dam
Dam	Farrer Dam
Dam	Clough Dam
Dam	Smith Pond Dam
Dam	Roberts Dam
Dam	Anderson Dam

JAMES L. TIGHE
PHILIP E. BOND
TELEPHONE
HOLYOKE 5525

TIGHE & BOND
CONSULTING ENGINEERS
189 HIGH STREET
HOLYOKE, MASSACHUSETTS

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
WATER POWER
DAMS

November 13, 1951

The Hon. The Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

Attention: William F. Stapleton, Chairman

Gentlemen:

The undersigned has completed the work of inspecting and checking all of the dams in the Town of Brimfield and a portion of the dams in the Town of Monson and finds that the following dams require certain maintenance and repairs:

A. Maple Lake Dam in Brimfield: There is a leak adjacent to the drawoff pipe through the dam. Flashboards are still in place on the dam. The flashboards should be removed each year during the Winter and Spring seasons and the pond should be drawn down and the leak investigated and repaired.

B. R. B. Pierce Dam in Brimfield: No pondage is formed by this dam. The flow of the stream passes through the dam at about the center section where pipelines have been constructed through the dam. The influent structure to the pipelines was partly blocked with debris. The debris should be cleaned from time to time to guarantee free passage of water through the pipelines, or the dam should be breached or properly repaired.

C. J. R. Smith Dam in Brimfield: This dam is formed by the Highway fill carrying Brimfield Road westerly from Warren Road. Water ponds southerly of the Highway fill and passes through the Highway in what appears to be an old stone culvert. It is doubtful if this structure can be classified as a dam, however, it is inspected annually since plugging of the culvert could cause formation of a large pond and eventual failure and loss of the road. It would be advisable to clean and maintain this culvert in order to guarantee free passage of water under the road.

D. Smith Pond in Monson: Adjacent to the spillway section of the dam at the northerly abutment, burrow holes were noted in the embankment. Earthfill behind the south abutment is low. The burrow holes should be investigated and filled and earthfill brought to grade behind the south abutment.

E. Springfield Sportsmen's Dam in Monson: Fish screens were found in place on the main spillway and the swale spillway. The swale spillway is not large enough to allow for year-round use of fish screens. Fish screens should either be redesigned and reconstructed for year-round use, the swale spillway should be enlarged, or the screens should be removed during each Winter and Spring season. The leak at the base of the dam has not been plugged, however, this leak does not seem to be of serious nature.

F. W. R. Elliot Dam in Monson: This dam appears to be under construction and is probably an enlargement of an older, small structure. It would seem that the dam is too small in height, the pond too small in volume, and the drainage area too small in area to have the structure come within County control. However, since it appears that construction is still continuing, it is thought advisable to notify the owner of the requirements should his construction exceed the basic limits and thereby bring the work within County control.

G. Anderson Dam in Monson: A hole was noted in the fill of the dam adjacent to the spillway. This hole seems to have been washed. It should be investigated and packed with tamped gravel. Stop planks in the spillway are too high and should be removed to allow for a 24-inch freeboard in the spillway until a proper swale spillway is provided.

H. W. C. Moulton Dam, Chicopee Brook in Monson: It was noted that flashboards were still in place on this dam and it appeared that the power unit was not in use. If power is not to be developed at the dam throughout the Winter and Spring months, it would be advisable to remove the flashboards during these two seasons.

I. W. C. Moulton Dam on a Tributary to Chicopee Brook in Monson: Leaves and debris partially block the influent to the culvert under Palmer lower road. Settlement of earth over the culvert directly in front of the dam indicates possible failure of the culvert underground. This condition should be investigated.

J. Paradise Pond Dam in Monson: A partly blocked screen was found on the spillway in front of the spillway channel. This screen should be removed during the Winter and Spring seasons or a proper screen structure should be built to provide for year-round use.

Respectfully submitted,

By George H. McDonnell
George H. McDonnell
County Hydraulic Engineer

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

CD Brimfield

Dec. 5, 1956.

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

Gentlemen:

Recent inspections of dams in the Town of Brimfield have now completed the inspection routine in this community and all dams have been examined one or more times during 1956. The following is a report on the condition of the various dams situated in Brimfield.

A. Springfield Boys Club Dam.

This is a small dam constructed of earth and masonry situated on Mill Brook southerly of State Highway Route #20 approximately midway between Brimfield and East Brimfield. This dam apparently has not been actively used for many years. Inspections during the past have shown the dam to be partially breached with no pond formed. The gate is usually open and water flowing freely thru the dam. During the flood of August 1955, the dam apparently was topped as has been the case during previous floods. No damage of consequence occurred and the dam apparently is not to be used as an active structure in the future. Conditions are such that little or no water is ever ponded and the structure seems satisfactory.

B. Snell Dam.

This is a dam site on the Quinebaug River, in the East Brimfield section. The site is adjacent to the East Brimfield Road leading from Holland to East Brimfield. All traces of the old dam have long gone and the only evidence is the natural waterfall where the stream cascades over the ledge in the vicinity of the old headworks to the canal system. For a number of years there has been no active dam at this site, although water is ponded by the natural ledge formation. Following the flood of August, 1955, there was a desire by the citizens upstream, and particularly those in Holland, to lower the level of Holland Pond and the Quinebaug River. This was accomplished to some extent by the reactivation of the old canal. Water now flows thru culverts under East Brimfield Road and in the old canal itself. This flow aids in maintaining a lower level upstream of the old Snell Dam site. Since no man-made structure now impounds water at this location, the site is checked annually simply to be certain that no change in the elevation of the ledge is made by anyone that could result in a backing up of water other than that caused by the natural formation.

C.G.S. Macallister Dam(Little Alum Pond)

This is a very small earth embankment with a narrow and relatively small spillway section thru the embankment. The majority of the pond volume apparently is a natural pond and the small dam situated at its outlet at the easterly end of the pond, near Little Alum Road, was undoubtedly built to raise the water level in this natural basin. The flood of August 1955, caused no damage of consequence to this earthen structure. There was a small wash downstream of the dam and Little Alum Road itself was washed out. The small wash relative to the dam has been fixed and the structure when last inspected was found to be in satisfactory condition.

D. W. D. Cheney Dam.

This is a small earthen and boulder dam situated on Baker Pond. Baker Pond is located in the extreme northeasterly corner of Brimfield on a tributary to the brook system draining to Long Pond in Sturbridge. At the time of the August 1955 flood, the Cheney Dam was topped by the storm water but no damage occurred to the structure. When last inspected this dam was in satisfactory condition.

E. Morgan Dams These are two in number and the site of these structures is on East Brook just upstream from Sherman Pond. These dams have been breached for many years and no water has been stored behind them. The site of these two structures is inspected annually to be certain that no one closes the breach and blocks the free waterway of East Brook.

F. J. R. Smith Dam.

This dam is really nothing more than the road fill of Brimfield Road at the intersection with Warren Road, in the northerly portion of Brimfield. A small culvert extends under the road to carry local drainage into Taylor Brook. The grade of the culvert is such as to continually cause the formation of a small pond upstream of Brimfield Road. It is doubtful if this structure is a County Dam. It probably is nothing more than an inadequate highway culvert causing the ponding of a small amount of water. The site is inspected annually to see if the road area is endangered by the stored water. When last inspected, conditions at this location seemed normal. Considerable debris is lodged at the opening of the culvert and for the purpose of protecting Brimfield Road it might be well to notify the Selectmen of Brimfield of the advisability of cleaning this debris from in front of the culvert to allow for reasonably free flow of surface water under the roadway.

G. Wheeler Dam.

This is the dam on Mill Brook at Mill Road just southerly of State Highway Route #20, near the center of Brimfield. This is an earthen

embankment carrying the road pavement and has a masonry spillway. The pond formed by the dam is fairly large in volume and provided power for a small mill located immediately downstream and on the right bank at the site of this dam. During the flood of August 1955, the flood water washed over the dam and the road causing two major washouts. The northerly road bridge pier over the spillway and part of the spillway itself were washed away. A washout occurred thru the embankment of the dam and the spillway bridge was lost into the spillway area itself.

At the time of the last inspection, and at the present time, this dam is under reconstruction as a flood project. The earthen embankment is being replaced and enlarged while the spillway is being replaced with a new and larger masonry overflow structure. A new highway bridge is to be built across the spillway. The construction at this dam has been inspected from time to time and numerous conferences have been held with the designer during the time of the plan preparation. Work on the dam is progressing satisfactorily.

H. Clough Dam.

This is the site of a former dam that has been breached for many years. It is just upstream from Hollow Road on a tributary to Hollow Brook at a point approximately half-way between State Highway, Route #20 and the Brimfield-Wales town line. The site of this structure is inspected annually to be certain that the breach is not closed and that a free waterway is maintained.

I. Dearth Hill Pond Dam.(Brimfield State Forest,Mass.Dept of Conservation

This is an earth and masonry dam constructed easterly of Dearth Hill Road in the Brimfield State Forest. There are two spillways at this dam, one near the center section and one at the right end. As a result of the flood of August 1955, the channel downstream of the spillway on the right side is somewhat washed out. Repair work at this location seems advisable. A leak exists under the right spillway just downstream of the masonry face and near the left corner. It is recommended that this leak be investigated and if found serious, repaired. The washout downstream of the right spillway should be repaired.

J. Woodman Pond Dam.(Brimfield State Forest,Mass.Dept.of Conservation)

This is a relatively low but long earth embankment dam with two masonry spillways. The dam is located on Woodman Pond in the Brimfield State Forest near the Brimfield-Wales town line. In the flood of August 1955, the water topped the dam and washed out a section of the earth embankment near the right end. This washout has been repaired with what appears to be a relatively sandy gravel fill. Leakage is taking place under this fill. The leakage is probably not dangerous to the safety of the dam but may be at a sufficiently high rate to cause the emptying of the pond during dry weather. It would be advisable to take steps to tighten the fill and reduce the leakage thru this material.

K. Monette Dam.

This was formerly the Pierce Dam. It is located on Foskett Mill

Stream in the southwesterly portion of Brimfield just upstream from Monson Road near the intersection of Sutcliffe Road. In the past the gate at this dam has been opened and no pond forms. From time to time there has been some sign of improvement being made around the dam and the work at the structure has been discussed with the Owner. In the flood of August 1955, the spillway section of the dam was washed thru completely. This dam was a combination earth and masonry structure. The masonry and boulders of the gate area and the spillway have been completely removed and washed out by the flood. A free waterway now exists at the site of this dam.

L. Humpage Dam. This is an abandoned and breached structure formerly constructed of earth and masonry, located downstream from the Monette Dam just described. This dam has not ponded water for many years. The site of the structure is inspected annually to be certain that a free waterway is maintained in the area.

M. Kaplinger Dam.

This dam is located in the southwesterly corner of Brimfield on a brook that is a tributary to Foskett Mill Stream. It is located approximately 1,500 ft. northeasterly of Dean Pond. This dam is a small earth and masonry structure that formed a pond for private use. For years little or no water has been stored at this site. The breach thru the dam made many years ago is inspected annually to be certain that no water is again stored and a free waterway maintained.

N. Dean Pond Dam(Brimfield State Forest,Mass. Dept. of Conservation)

This dam is a relatively high earth embankment structure with a large masonry overflow spillway. The pond formed by the dam is used for reacreational purposes. The dam is located just westerly of Sutcliffe Road in the southwesterly corner of Brimfield. Dean Pond, formed by the dam, extends upstream into Monson. No damage of any consequence was done to this structure as a result of the flood of August 1955. When last inspected, the dam and the spillway were in good condition.

O. Maple Lake Pond Dam.

This is a stone masonry structure near the intersection of Sutcliffe Road with Palmer Road just southerly of State Highway Route #20. At one time this structure apparently was used for power purposes in connection with a local mill. At the present time it is used for recreational and aesthetic purposes in connection with the Maple Lake Inn. The dam is relatively long and high. The pond formed by the dam is quite shallow. The pond area itself has been filling up for many years with debris, silt, and sand. Consequently, the depth of water behind the dam is but a very few feet at most. This dam was topped by the flood water of August 1955. The spillway structure and the dam itself were not seriously damaged by the flood water. Earth downstream of the dam was washed out. The masonry structure held, however. At the present time the flashboards have been re-

moved from the dam and no water is stored at this site. The Owner of the dam has been notified in the past that certain repairs will be required before water is again stored behind the structure. The Owner should again be reminded that before flashboards are replaced at the dam and water ponded, the structure should be properly repaired and placed in good condition.

P. Roberts Dam. This is an old abandoned and breached structure that was located on Blodgett Mill Brook, in the northwesterly corner of Brimfield just upstream from the West Brimfield-Palmer Road. No water has been stored for many years behind this dam. The site of the structure has been inspected annually to be certain that the breach is not closed without proper authorization. No evidence of the dam now remains. The flood waters of August 1955, did considerable damage in the area. Also, major changes to the topography by the construction of the new Toll Highway have resulted in what would probably have been the complete abandonment of any possible dam at this site in the future. The stream at the site of the old Roberts Dam has a free waterway and there is no evidence of any dam to impound or restrict the flow of water.

Q. Moulton Dams. These were small earth and masonry structures impounding very little water and situated on Blodgett Mill Brook upstream of the Roberts Dam. At one time these Moulton Dams, two in number, provided water for manufacturing use. For many years the dams have not been active but the site of each of the structures has always been examined annually to be certain that the breach in each of the structures is not closed and that no water is ever ponded behind the dams. As a result of the flood of August 1955, coupled with major changes in the topography of the area caused by the Toll Highway construction, all evidence of these two dams has been eliminated.

R. Farrer Dam.

This was a masonry and earth dam located in the northerly section of Brimfield on Blodgett Mill Brook just upstream from Lyman Road. In fact, the fill of Lyman Road formed a portion of the dam. During the flood of August 1955, the road and dam were washed out. Prior to that time little or no pond was ever formed behind Farrer Dam. The pond has silted up considerably and vegetation has grown up throughout the entire pond basin. The spillway of the dam itself was stone masonry and though it was rough it was in fairly good condition prior to the flood. At the present time, no pond is formed and since the washout the dam has not been replaced. The road fill has been reconstructed but rather than replace the spillway, a large culvert that could be classed a bridge has been constructed over the stream and a free waterway now exists where the dam once stood.

In summary there are 20 dams and dam sites in the Town of Brimfield. Nine of these locations are old dam sites that are inspected annually to be certain that a free waterway is maintained at all times. Of the 11 active dams in the Town, 2 were washed out and repaired while 3 suffered minor damage and are now in reasonably good condition. 2 dams were washed out by the flood of August 1955 and abandoned. One of these dams, the Farrer Dam, has had repair work done at the site by the replacement of the embankment for the purpose of carrying Lyman Road. The spillway has not been rebuilt but has been replaced with a large culvert. Thus, the dam is gone and no water will be ponded at this site.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

Chester Dam Inspections - 1970



1970 Reports

Inspections by Tighe & Bond.

City/Town	Chester
Dam	Huntington Water Works Dam
Dam	Smith Dam
Dam	Ideal Lodge Dam
Dam	Boulder Park Dam
Dam	Newell Dam
Dam	Chester Water Works Dam
Dam	Chester State Forest Dam

GEORGE H. McDONNELL
PHILIP W SHERIDAN
EDWARD J BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Chester
July 29, 1970

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Each dam situated within the Town of Chester has been inspected at least once during the year 1970. The following is a report on the general conditions noted at each of these dams.

A. Chester Water Works Dam

This dam was found to be in very good condition. The concrete shows little sign of weathering, cracking or erosion. On the day of inspection, a stoplog was in each of the two notches of the dam, one to the left of the gatehouse and one in the spillway section to the right of the gatehouse. Water overflowed the spillway at the right of the gatehouse and a small trickle discharged thru the small stoplog notch to the left of the gatehouse.

An examination of the toe area of the concrete dam in the bed of the stream showed conditions to be satisfactory.

Abutment areas were examined and found to be very good.

This dam is always found to be in good condition and well maintained. No changes have been made at the dam since the time of the last inspection and the dam was considered safe when checked.

B. Huntington Water Works Dam

This dam was observed to be in better condition than reported last year. Brush has been cut from both embankment sections forming the dam. However, brush is beginning to grow again and, by the end of this summer, will be quite thick, on the left embankment section. The owner should keep brush cut down and should take the necessary steps to develop a good growth of turf on the top and the sloping sides of each of the two embankment sections.

The toe of each embankment section was found to be in satisfactory condition.

On the day of inspection water was overflowing the spillway and there were no flashboards or stoplogs on the masonry crest.

The second step of the spillway down from the crest is badly eroded and repairs should be made to this step in the near future. Repair work could be done by drawing down the reservoir a few inches below the elevation of the spillway. The step could then be thoroughly cleaned and roughened. Dowels could be drilled into the step and leaded in place. A wooden form could then be placed at the front of the step and concrete poured to re-shape and re-form the step.

Each side wall of the spillway needs maintenance in that cracks and open joints as well as eroded areas should be repaired with concrete grout and patching material.

Concrete repair work should be done during good weather and, if the day when the work is done is hot and sunny, newly placed concrete or patching should be kept shaded and wet. This could be accomplished by covering the newly placed concrete with wet burlap or other similar material.

C. Chester State Forest - Boulder Park Dam

This small dam was found to be in satisfactory condition. The spillway was o.k. Masonry showed no sign of erosion or wear. There were no stoplogs on the crest of the spillway and water level in storage was at crest elevation.

The earth embankment was found to be in satisfactory condition. The top of the embankment is covered with a fair growth of turf. The toe area of the embankment was observed to be relatively dry. The drainpipe outlet structure was in satisfactory condition.

The water side slope of the embankment was in good condition and the stone paving of this surface was o. k.

Though fairly large trees are growing on the downstream face of the embankment, it is the opinion of the undersigned that these trees do not as yet endanger the small dam.

No changes have been made at this dam since the time of the last inspection and the dam was considered safe when checked.

D. Homer E. Newell Dam

This small dam was in the same general condition as noted previously except that seepage around and thru the right abutment area is occurring at a higher rate than observed previously. The seepage emerges from the concrete below the spillway and on the right side of the stream.

Seepage at the left abutment and thru the left abutment area is about normal.

The condition as observed at the right is not dangerous but the amount of seepage should be observed at the time of each inspection and if the masonry at and below the right abutment begins to deteriorate more seriously than has been experienced to date, the owner should then be advised to decrease seepage and make the necessary abutment repairs.

The toe of the dam in the stream bed was o. k. There was some evidence of erosion but it is not bad.

Stoplogs were in place in the concrete forming the dam up to an elevation equal to the top of the concrete structure. Water level was passing over the spillway crest.

No changes have been made at this dam since the time of the last inspection and, as long as the right abutment area does not deteriorate further, conditions at the dam are satisfactory.

E. Hugh C. Smith (now Ideal Lodge)

This dam has deteriorated further since the time of the last inspection. Water now flows around and thru the right abutment area where the stone fill has been nearly completely washed out.

At the left end of the dam, the abutment construction adjacent to the end of the dam has broken away and water flows around the left side of the dam thru the worn, broken and eroded earth and plank abutment construction.

At about the third point of the dam from the left abutment the crest has settled and there is a well defined depression in the crest.

On the day of inspection the full flow of the stream passed around the dam at the right and the left abutment. The undersigned was able to walk across the dam on the crest, even at the area where the crest has sagged.

The top planking on this timber and log crib dam is in fairly good condition. The crest ends of some of the plank have become broken.

In the opinion of the undersigned, unless major repairs are completed at each abutment of the dam and, unless the sagging area is repaired, the dam will begin to deteriorate much faster and eventually will be a total loss. Complete loss could occur any time during heavy fall and spring runoff conditions beginning with the coming fall, winter and spring season.

The amount of water stored by this dam is quite small. The basin upstream of the dam has been nearly filled with gravel and boulders washed down from upstream in flood flows of past years. Loss of the dam would not endanger persons and property downstream because little water would be released by a sudden and complete failure of the dam.

If the owner wishes to maintain the dam and have it active in years to come, repairs should be made this year before further deterioration occurs and complete loss of the dam is experienced.

Respectfully submitted,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/amd

Chicopee - Bemis Pond Dam repairs - 1957



1957 Reports

Specifications for repairs filed August 2, 1957 for Bemis Pond Dam Repairs Playground Commission, Chicopee by Tighe & Bond.

City/Town	Chicopee
Dam	Bemis Pond Dam
Water	Bemis Pond

PLAYGROUND COMMISSION

CHICOPEE, MASS.

* * * * * * * * *

ADVERTISEMENT FOR BIDDERS

Sealed proposals addressed to the Playground Commission, City Hall, Chicopee, Mass., and endorsed "Proposal for Repair of the Bemis Pond Dam" will be received by the Playground Commission at it's office, City Hall, Chicopee, Mass., until
and at that time and place publicly opened and read aloud. Work includes the construction of approximately: 87 feet of six (6) feet by seven (7) feet reinforced concrete discharge conduit; a six (6) foot by seven (7) foot vertical intake structure; the reconstruction and restoration of a section of earthen dam; the alteration to concrete foot bridge and spillway walls; and the placement of riprap in the discharge channel.

Proposal Guaranty: $1,000.00 certified check or lawful money. Plans, specifications and proposal forms may be obtained at the office of Tighe & Bond. Inc., Consulting Engineers, Bowers & Pequot Streets, Holyoke, Mass., or at the office of City Engineer, City Hall, Chicopee, Mass. Charge for Plans and Specifications $10.00. Said amount returnable to bidders who return Plans and Specifications in good condition within seven (7) days after the opening of bids. Minimum wage rates established. A Performance and Payment Bond in the full amount of the contract will be required. The Playground Commission reserves the right to waive any informality in or to reject any or all proposals, or to accept any proposal which, in their opinion, is in the best interests of the City. No proposal may be withdrawn within thirty (30) days after the bid opening.

PLAYGROUND COMMISSION

CHICOPEE, MASS.

PROPOSAL

FORM



TIGHE & BOND

CONSULTING ENGINEERS

HOLYOKE, MASS.

PROPOSAL
TO THE

PLAYGROUND COMMISSION
CHICOPEE, MASS.

FOR THE
REPAIR OF THE BEMIS POND DAM

The undersigned bidder declares that the only person or parties as principals interested in this proposal are named below, that this proposal is made without collusion with any other person, firm or corporation, that he has carefully examined the location of the proposed work and has taken into consideration all the difficulties likely to be met with in the doing of the work, that he also has carefully examined the annexed form of contract and the plans therein referred to and entitled:

"BEMIS POND
DAM REPAIRS
PLAYGROUND COMMISSION
CITY OF CHICOPEE, MASS."

TIGHE & BOND, INC.
Consulting Engineers
Holyoke, Mass.

Complete set ---- sheets
June - 1957 "

And he proposes and agrees that he will contract with the City of Chicopee, Mass., acting thru its Playground Commission, in the form of contract annexed to provide all the insurance, labor, machinery, tools, apparatus and other means of construction and to do all the work and furnish all the materials specified in the contract and in the manner and time therein prescribed and in accordance with the requirements of the Engineer, as herein set forth and that he will take in full payment therefor the following sums to wit:

ITEM NO.	ESTIMATED QUANTITIES	UNIT BID PRICE WRITTEN IN WORDS AND FIGURES	AMOUNT OF ITEM DOLLARS	CENTS.
1.	Lump sum	For furnishing all labor, tools, materials and equipment required for the construction of the intake structure, discharge conduit, the re-alignment of the existing cast iron draw-down pipe and the sluicegate in accordance with the details shown on the plan and as further described in the specifications, the sum of: _____ ($ _____) Lump sum	$ _____	
2.	Lump sum	For furnishing all labor, tools, materials, and equipment required to construct an access bridge from the top of the dam embankment to the top of the intake structure in accordance with the details shown on the plan and as further described in the specifications, the sum of: _____ ($ _____) Lump sum	$ _____	
3.	Lump sum	For furnishing all labor, tools, materials and equipment required to prepare the foot bridge across the existing spillway for the alteration of the existing concrete walls forming the abutments for the bridge and for the restoration of the bridge after completion of the alterations to the walls in accordance with the details shown on the plans and as further described in the specifications, the sum of: _____ ($ _____) Lump sum	$ _____	
4.	150 cu. yds	For each cubic yard of trench excavation and backfill completed around the existing walls at the foot bridge and spillway and for placing riprap downstream from the discharge conduit and existing spillway and for installing concrete steps abutting the access bridge, including all labor, materials, tools, equipment and control of water, required for or incidental to the item as herein described, the sum of: _____ ($ _____) cu. yds.	$ _____	

ITEM NO.	ESTIMATED QUANTITIES	UNIT BID PRICE WRITTEN IN WORDS AND FIGURES	AMOUNT OF ITEM DOLLARS	CENTS
5.	11 cu. yds	For each cubic yard of 3,000 lb. 28-day test concrete furnished and installed in altering the walls at the foot bridge and along the existing spillway and for the steps between the top of the bridge embankment and the end of the access bridge, including all labor, tools, materials and equipment required for or incidental to the item, as herein described, the sum of: _____ ($ _____) cu. yds	$	
6.	385 lbs.	For each pound of reinforcing steel furnished and installed in the concrete wall alterations around the footbridge and spillway and in the concrete steps, between the top of the embankment and the end of the access bridge, including all labor, tools, materials, bending and cutting required for or incidental to the item, as herein described, or as required, the sum of: _____ ($ _____) per lb.	$	
7.	240 cu. yds.	For each cubic yard of riprap furnished and placed in the discharge channel downstream from the discharge conduit and around the existing spillway, including all labor, tools, material, equipment, and control of water required for or incidental to the item, as herein described, the sum of: _____ ($ _____) per cu. yd.	$	

ITEM NO.	ESTIMATED QUANTITIES	UNIT BID PRICE WRITTEN IN WORDS AND FIGURES	AMOUNT OF ITEM DOLLARS	CENTS
8	150 sq. yd.	For each square yard of filling, loaming, seeding & fertilizing, completed in the areas abutting the existing spillway walls including all labor, tools, materials and equipment required for or incidental to the item, as herein described, the sum of: _____ ($ _____)	$	

TOTAL AMOUNT OF BID - Items 1 thru 8, inclusive $_____

If this proposal shall be accepted by the Playground Commission, Chicopee, Mass., the undersigned bidder agrees to meet the requirements of Article 62 regarding the beginning of work, and he further agrees to the provisions of Article 67 and specifies that the job shall be completed within _____ calendar days (fill in using both letters and figures) from the date of the signing of the contract.

If this proposal shall be accepted by the Playground Commission of Chicopee, Mass., and the undersigned shall fail to contract as aforesaid and to give a performance and payment bond in the sum of the full amount of the contract with a surety company satisfactory to the Board within ten (10) days of the date of the notice to him from the Owner that the Contract is ready for signature, then he shall be considered to have abandoned the contract and his certified check for $1000.00 accompanying this proposal shall become the property of the City of Chicopee, Mass.

DATED THIS _____ DAY OF _____ in the year 1957.

SIGNATURE OF BIDDER _____

Name of Bidder: _____

BUSINESS ADDRESS _____

_____

RESIDENCE _____

_____

In compliance with Article 5, Section B, the Bidder, if this bid is submitted by a firm, partnership or corporation, shall list required information below:

_____

_____

_____

_____

_____

The proposed Surety Company on the Bond is to be as follows:

Name: _____

Address of Home Office: _____

_____

Name and address of Agent: _____

_____

_____

GENERAL

REQUIREMENTS



TIGHE & BOND

CONSULTING ENGINEERS

HOLYOKE, MASS.

GENERAL REQUIREMENTS

.....

DEFINITION OF TERMS

Article 1. Definition of Terms.

Wherever in these specifications of other contractual documents the following terms, or pronouns in place of them, are used, the intent and meaning shall be interpreted as follows:

Addendum ..... An addition to or alteration of the Plans and/or Specifications generally issued for clarification purposes prior to the opening of proposals.

Advertisement ... The notice published in newspapers and trade bulletins announcing the time and place for the opening of bids for work to be done.

A.A.S.H.O. ..... The American Association of State Highway Officials.

Alteration ..... Change in the form or character of any of the work done or to be done.

A.S.T.M. ..... The American Society for Testing Materials.

Bidder ..... Any individual, firm or corporation submitting a proposal for the work contemplated, acting directly or through a duly authorized representative.

Contractor ..... A party to the contract, acting directly or through an authorized lawful agent or employee.

Engineer ..... The Consulting Engineer acting directly or through an authorized representative, such representative acting within the scope of the particular duties entrusted to him.

Extra Work ..... Work or materials not called for in the Plans and Specifications and which is deemed necessary for the proper completing of the improvement.

Layout ..... See Right of Way.

Location ..... See Right of Way.

Material ..... Any substance proposed to be used in connection with the construction of the project and its appurtenances.

Owner ..... The duly authorized official or officials in charge of the project.

Plans ..... The contract drawings, Detail Sheets, or exact reproductions thereof, which show the location, character, dimension and details of the work including any alterations thereof permissible under the contract and authorized by duly approved written orders.

Proposal ..... The written offer of the Bidder submitted in approved form to perform the work contemplated.

Project ..... The purpose for which bids have been called and work contracted for.

Right of Way .... That area which has been laid out or acquired for the purpose of this project.

Special Provisions .. The special directions, provisions and requirements prepared to cover proposed work not satisfactorily provided for by these General Requirements. These special provisions shall be included within the general term "Specifications" and shall be made a part of the contract with the express purpose that they shall prevail over all other specifications.

Specifications .. The directions, provisions and requirements, designated as Specifications, together with all written agreements made or to be made pertaining to the method and manner of performing the work, or the quantities and qualities of materials to be furnished under the Contract. The Specifications shall include the Advertisement, Proposal Form, General Requirements, Standard Detail Drawings, Special Provisions, Addenda and Contract Form.

Work ..... All performance, including the furnishing of materials, labor, tools, equipment and incidentals, required of the Contractor under the terms of the contract.

The Words ..... "As directed", "as permitted", "as required" or words of like effect shall mean that the direction, permission or requirement of the Engineer is intended, and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean approved by or acceptable or satisfactory to the Engineer, unless otherwise provided herein. The words "necessary", "suitable", "equal" or words of like import shall mean necessary, suitable or equal in the opinion of the Engineer.

The words "approval of the Owner" or "approval by the Owner" shall mean approval either by vote of or in writing by the duly authorized officials.

PROPOSAL REQUIREMENTS AND CONDITIONS

Article 2. Contents of Proposal Forms.

Proposal forms consisting of the documents listed below will be furnished by the Owner to the bidder upon request at the office of the Engineer.

A. The Specifications; including the Advertisement, General Requirements, Special Provisions, Standard Detail Drawings, Addenda, Proposal Form and Contract Form.

B. The Plans.

Article 3. Interpretation of Basic Estimate of Quantities.

A. All bids will be compared on the basis of the Engineer's estimate of quantities of work to be done, as shown in the Proposal.

These quantities are approximate only, being given as a basis for the comparison of bids, and the Owner does not expressly or by implication agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class, item or portion of the work, as may be deemed necessary or expedient by the Owner.

Bidders are required to submit their estimate upon the following express conditions, which shall apply to and become part of every bid received, viz:

> An increase or decrease in the quantity for any item or group of items shall not be regarded as cause for an increase or decrease in the prices, nor in the time allowed for the completion of the work, except as provided in the contract. An increase or decrease in the quantity of work to be done shall not warrant any claim for loss, damage or anticipated profit.

B. The work has been divided into classes and items in order to enable the bidder to bid on the different portions of the work in accordance with his estimate of their cost, so that in the event of an increase or decrease in the quantities of any particular class of work the actual quantities executed may be paid for at the price bid for that particular class of work.

Article 4. Examination of Plans and the Location.

Statements as to the condition under which the work is to be performed, including plans, surveys, measurements, dimensions, calculations, estimates, borings, etc., are made solely to furnish a basis for comparison of bids, and the Owner does not guarantee or represent that they are even approximately correct. The Contractor must satisfy himself by his own investigation and research regarding all conditions affecting the work to be done and labor and material needed, and make his bid in sole reliance thereon. The Contractor should carefully examine any materials furnished

by the Owner, the location of the work, the difficulties likely to be met in doing the work and all other factors relating to the Project.

Article 5. Preparation of Proposals

A. Bid Prices.

The Bidder shall submit his proposal upon the blank forms furnished by the Owner. The bidder shall specify a unit price, in both words and figures, for each and every item for which a quantity is given, and shall also show the products of the respective unit prices and quantities, written in figures in the column provided for that purpose, and the total amount of the proposal obtained by adding the amounts of the several items. All words and figures shall be in ink. In case of a discrepancy between the prices written in words and those written in figures, the written words shall govern. In case of a discrepancy between the unit prices and the extended totals, the unit prices shall govern.

No bid will be accepted which does not contain a unit price for every item shown on the Proposal Form. No conditional bids will be accepted.

When an item in the Proposal contains a choice to be made by the bidder, the bidder shall indicate his choice in accordance with the specifications for that particular item, and thereafter no further choice will be permitted without permission from the Owner.

The price for any item, bid and/or contracted for, unless otherwise noted or specified shall include full compensation for all materials, equipment, tools, labor and incidental work, necessary to complete the item to the satisfaction of the Engineer. The prices shall, without exception, include all royalties and costs arising from patents, trademarks, and copyrights in any way involved in the work.

B. Signatures.

All proposals shall be signed correctly with ink in the proper places provided, as follows:

If the proposal is made by an individual, his name and post office address shall be given.

If the proposal is made by a firm, partnership or corporation it shall be signed by a person having such legal authority from the said firm, partnership or corporation and the person so signing the proposal shall give his own name and title (if any) in addition to the name and address of the firm, partnership or corporation.

If the proposal is made by a firm or partnership the names and addresses of the individual members shall be given.

If the proposal is made by a corporation, the name of the State under the laws of which the corporation was chartered and the names, titles and business addresses of the President, Treasurer and Manager shall be given.

Article 6. Delivery of Proposals.

Each Proposal shall be submitted to the Owner in a sealed envelope. On the outside of the envelope shall be written the bidder's name and address and the name of the project for which the bid is submitted.

If forwarded by mail, the sealed envelope containing the Proposal, and marked as directed above, must be enclosed in another envelope addressed to the Owner. The recommended method of mailing shall be "Registered-Return Receipt Requested."

Proposals received by the Owner at the designated place after the time designated in the Advertisement for Bidders will be returned to the bidder unopened.

It is the bidder's responsibility to see that his Proposal is at the designated place at the designated time. The Owner will not receive any Proposal not delivered to the designated place.

Article 7. Proposal Guaranty Required.

In order to insure the faithful fulfillment of its terms, each Proposal shall be accompanied by a certified check or lawful money as directed in the Special Provisions. Said check will be returned to the bidder unless retained by the Owner under the conditions hereinafter stipulated.

A bid bond will not be accepted as security.

Article 8. Public Opening of Proposals.

Proposals will be publicly opened and read aloud at the time and place indicated in the Advertisement for Bidders. Bidders or their authorized agents are invited to be present.

Article 9. Rejection of Proposals.

Proposals which fail to meet the requirements of Articles 5, 6 and 7, or which are incomplete, conditional or obscure, or which contain additions not called for, erasures, alterations or irregularities of any kind, or in which errors occur, or which contain abnormally high or abnormally low bid prices for any class of item of work, may be rejected as informal. The Owner may waive any informalities in or reject any or all bids and may accept any bid the Owner deems to be in his best interests or in the best interests of the group represented by the Owner.

More than one proposal from the same bidder, whether or not the same or different names appear on the signature page, will not be considered. Reasonable proof for believing that any bidder is so interested in more than one proposal for the work contemplated will cause the rejection of all proposals made by him directly or indirectly. Any or all proposals will be rejected if there is reason for believing that collusion exists among the bidders.

Bidders whose proposals have been rejected because of evidence of collusion as specified in Article 9 will not be considered in future proposals for the same work, and such bidders may be disqualified from bidding on future work.

Article 10. Withdrawal of Proposals.

Any bid may be withdrawn prior to the scheduled time for opening as shown in the Special Provisions or authorized postponement thereof.

No bidder may withdraw a bid within 30 days after the actual date and time of the opening thereof.

Article 11. Competency of Bidders.

No contract will be awarded except to responsible bidders capable of performing the class of work contemplated. Before the award of the contract, any bidder may be required to show that he has the necessary facilities, experience, ability and financial resources to perform the work in a satisfactory manner and within the time stipulated. If the contract contains special work of a complicated nature or if it contains items for materials or work the character of which will depend upon the Contractor's skill or experience, he will be required to show proof that he has a satisfactory record of similar work performed or materials furnished under other contracts. Bidders may be required to furnish the Owner with formal sworn statements as to their experience and their financial status.

Article 12. Material Cuaranty.

Before any contract is awarded, the Bidder may be required to furnish without expense to the Owner a complete statement of the origin, composition and manufacture of any or all materials proposed to be used in the construction of the work, together with samples, which samples may be subjected to the tests required by the Owner to determine their quality and fitness for the work.

Article 13. Addenda and Interpretations.

No interpretation of the meaning of the plans, specifications or other contract documents will be made to any bidder orally. Every request for such interpretation should be in writing addressed to the office of Tighe & Bond, Consulting Engineers, Bowers & Pequot Streets, Holyoke, Mass., and to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if issued, will be mailed by registered mail with return receipt requested to all prospective bidders (at the respective addresses furnished for such purposes) not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or interpretation shall not relieve any bidder from any obligation under his bid as submitted. All addenda so issued shall become part of the contract documents.

AWARD AND EXECUTION OF THE CONTRACT

Article 14. Consideration of Bids.

The Owner reserves the right to reject any or all proposals, to waive technicalities, and to advertise for new proposals, or proceed to do the work otherwise, as it may deem best for its own interests.

Article 15. Award of Contract.

The bids will be compared on the basis of the totals of the sums obtained by multiplying the Engineer's estimate of quantities by the unit price stated on the Proposal for each respective item.

The lowest bidders will be determined as described in the above paragraph. The responsible bidders will be determined as described in Articles 9, 11 and 12.

The Contract will be awarded by the Owner as soon as practicable after the opening of bids. The successful bidder will be notified in writing, by mail, or otherwise, that his bid has been accepted and that he has been awarded the contract.

Article 16. Return of Proposal Guaranty.

The Proposal Guaranty will be returned to all except the three lowest formal bidders within three days after the opening of the bids. The Proposal Guaranty of each of the three lowest formal bidders will not be released by the Owner until after a Contract has been executed. Within three days after the signing of a Contract, the Proposal Guaranty of each of the three low bidders will be returned except as hereinafter provided.

The Proposal Guaranty submitted with any bid rejected as informal will be returned within three days of said rejection.

Article 17. Contract Bond Required.

Prior to the execution of the Contract, the Contractor will be required to furnish a surety bond in the amount specified in the Special Provisions as security for faithful performance of this Contract. The bond shall also guarantee payment of all persons performing labor on the project under this Contract and furnishing materials in connection with this Contract.

The bond must be in the usual and approved form and must also contain the following: "and shall pay for all labor performed or furnished and for all materials used or employed, and shall pay all persons who contract with the principal for labor and materials as provided in the

General Laws of Massachusetts, Chapter 149, then this obligation to be void, otherwise to remain in full force and effect."

Attorneys in fact who sign bid bonds or contract bonds must file with each bond a certified copy of their power of attorney to sign said bonds.

The surety is to be a bonding company or securities satisfactory to the Owner.

Article 18. Execution of Contract.

The Contractor to whom the contract is awarded will be required to appear at the office of the Engineer with the surety offered by him, and execute the contract within 10 calendar days from the date of the notice from the Owner or Engineer to the bidder that the contract is ready for signature. The contract shall be in writing on the forms provided.

Article 19. Failure to Execute Contract.

Should the successful bidder fail to execute the contract and furnish the contract bond insurance, as herein specified, within the time stipulated, the Owner may, at its option, determine that the bidder has refused to execute a Contract with the Owner. The Owner will consider the Proposal Guaranty forfeited by the Bidder. The Owner will then offer the Contract to the second lowest responsible Bidder.

SCOPE OF WORK

Article 20. Intent of Plans and Specifications.

It is the intent that the plans and specifications shall prescribe a complete work or improvement; and when the work is completed, the Contractor shall leave the job site in a neat and finished condition.

The Contractor shall do all the work and furnish all the materials, tools and appliances, except as otherwise specified, necessary or proper for performing and completing the work required by the contract, in the manner and within the time specified. He shall complete the entire work to the satisfaction of the Engineer, and in accordance with the specifications and drawings for the work, at the prices agreed upon.

All the work, labor and materials to be done and furnished under the contract shall be done and furnished strictly pursuant to, and in conformity with the specifications and the plans for the work, which said specifications and drawings shall form part of the contract, and also in accordance with the directions of the Engineer as given from time to time during the progress of the work, under the terms of the contract.

Article 21. Special Conditions.

Construction items or conditions anticipated for any proposed work, and not covered by these "General Requirements", will be described and specified in "Special Provisions". Said Special Provisions shall be

considered a part of the contract. In case of conflict between the said Special Provisions and General Requirements, the Special Provisions shall govern.

Article 22. Alteration of Work.

Should it be found desirable by the Engineer to make alterations in the form or character of any of the work done, or to be done, the Engineer may order such alterations to be made, defining them in writing, supplemented with drawings when in the opinion of the Engineer it is necessary, and the alterations shall be made accordingly; provided that in case such alterations increase the cost of the work the Contractor shall be remunerated at prices based on prices allowed on the same character of work under the specifications, and in case the alterations shall diminish the cost of the work no allowance will be made for anticipated profits.

In case of any alteration, change or addition to the work as originally contemplated, and if said alteration, change or addition justified an increase in the cost of the work, the Owner reserves the right to decide the method that will be used to determine said additional costs. (see Article 73.)

In case of any alterations, so much of the contract as is not necessarily affected by such alterations shall remain in force upon the parties thereto, and such alterations shall be made under the terms of and as a part of the contract, and the security for the performance of the contract shall in nowise be invalidated, but shall be held to secure in like manner the performance of the alterations made under the contract and of any extra work done under the provisions of Article 23.

The Contractor shall perform the work as increased or decreased within the qualifying limits named and subject to the provisions outlined above, but no allowance shall be made for any change in anticipated profits. Adjustments shall be considered waived unless specific complaint is made in writing by the Contractor previous to the construction of such alteration or change and within three calendar days following notice from the Owner of such alteration or change.

Article 23. Extra Work.

The Contractor shall do any work not herein otherwise provided for, when and as ordered in writing by the Engineer, such written order to contain particular reference to this article.

If the Contractor claims that any instructions from the Engineer involve extra cost or an extension of time, he shall so notify the Engineer in writing within three calendar days after the receipt of the Engineer's instructions and in any event before proceeding to execute the extra work. No claim from the Contractor will be considered valid unless made in accordance with the terms of this Article.

Such notice by the Contractor and the keeping of costs by the Engineer shall not in any way be construed as proving the validity of the claim.

Payment for extra work will be made in accordance with the provisions of Article 73.

The Owner may at any time, by a written order, and without notice to the Surety or Sureties, require the performance of such changes in the work as it may find necessary or desirable.

Article 24. Maintenance of Detours.

When required by the Owner, a project shall be closed to travel during construction. Suitable detours shall be provided and maintained as directed or as specified in the "Special Provisions" and in Articles 50 and 51. Payment for this work is to be included by the Contractor in his unit prices for the various items of work. No special payment will be provided unless otherwise stated under "Special Provisions."

Article 25. Removal and Disposal of Structures and Obstructions.

Existing structures such as bridges, culverts, dikes, walls, pipes, guard railing, fences, street railway ties and rails, found within the project limits on right-of-way, which are to be replaced or rendered useless by new construction shall be removed by the Contractor at his own expense unless otherwise provided in the Special Provisions. When their location is such as not to interfere with the work, the removal shall not be done until the new structures replacing them are ready for traffic or until the Engineer shall permit.

All material in existing structures requiring removal shall remain the property of the Owner. The material shall be removed without damage, in sections which will permit easy handling and disposal, to locations within the limits of the project, and convenient for their subsequent removal by the Owner, or as directed by the Engineer. All discarded material, rubbish or debris shall be removed from the work and disposed of as directed. No foreign material or debris shall be permitted to remain or move in a waterway.

Article 26. Rights in the Use of Materials Found on the Work.

The Contractor, with the approval of the Engineer, may take suitable ledge, gravel, sand, loam, clay or other material from within the location lines of the project under construction and use it for other purposes than for forming embankments. If such use necessitates securing additional material for forming embankments, the Contractor shall at his own expense, furnish an amount of borrow of a satisfactory quality, equal to the amount of material taken, as measured in excavation. The Contractor shall not excavate or remove any material which is not within the excavation as indicated by the slope stakes and grade lines, without written approval. No excavated material suitable for use shall be wasted, unless as directed.

Unless otherwise provided the material from any existing structure may be used temporarily by the Contractor during construction. Such material shall not be cut, bent, broken or otherwise damaged.

Nothing in the contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been attached or affixed to the work or the soil; but all such materials shall, upon being so attached or affixed, become the property of the Owner.

Article 27. Final Cleaning Up.

Upon completion of the work and before acceptance and final payment, the Contractor shall remove, at his own expense, from the project location and from adjoining property, all temporary structures and all surplus material and rubbish which may have accumulated during the prosecution of the work, and shall leave the work broom clean and in a neat and orderly condition. The Contractor shall clean up the job so that the condition of the site will be at least equal to its condition before work began.

No equipment or materials shall be left on the right-of-way or project limits without the written permission of the Engineers.

CONTROL OF WORK

Article 28. Authority of the Engineer.

The Engineer shall decide all questions which may arise as to the quantity, quality, acceptability, fitness and rate of progress of the several kinds of work to be performed and materials to be furnished under the contract, and shall decide all questions which may arise as to the interpretation of any part of the contract, especially the plans and specifications which are a part thereof, as to the fulfillment of this contract on the part of the Contractor, and the determination and decision of the Engineer shall be final and conclusive; and such determination and decision, in case any question shall arise, shall be a condition precedent to the right of the Contractor to receive any money hereunder.

Article 29. Plans and Detail Drawings.

Approved plans, profiles and sections on file in the office of the Engineer will show the location, details and dimensions of the work contemplated, and all work shall be in strict conformity therewith and with the specifications.

Supplemental plans and detail drawings as required in the specifications and furnished by the Contractor shall upon approval become a part of the complete plans. Such approval of supplemental plans or detail drawings, however, shall not be construed as a complete check and shall not operate to relieve the Contractor of any of his responsibility under the contract for the satisfactory completion of the work, nor for the accuracy of the dimensions, details or quantities or for their agreement.

When submitting detail drawings for approval, complete sets of prints as directed shall be furnished the Engineer who will return one set either approved or with corrections marked thereon. Finally, the Contractor shall

furnish the Engineer with complete sets of prints as directed of the corrected and approved detail drawings. No changes shall be made in the approved drawing without the written consent of the Engineer.

The contract price shall include the cost of furnishing all working drawings and the contractor will be allowed no extra compensation therefor. The Engineer will specify the number of sets of approved detail drawings that will be required.

Any work done or materials furnished by the Contractor prior to the approval of the working drawings shall be at his own risk.

Article 30. Conformity with Plans and Allowable Deviations.

The finished work shall conform in all respects to the lines, grades, cross sections and dimensions given on the approved plans. Where conditions make it necessary or desirable for major deviation from the approved plans, such changes shall be made as specified in Article 22 and 23, upon authorization in writing by the Owner.

Article 31. Co-ordination of Specifications and Plans.

The General Requirements, the Addenda, the Proposal Form, the Contract Form, the Plans, the Special Provisions, and all supplementary documents are essential parts of the Contract, and a requirement occurring in one is a binding as though occurring in all. They are intended to be cooperative; to describe and provide for a complete work. In case of disagreement, the Plans shall have precedence over the General Requirements and the Special Provisions shall govern over both the Plans and the General Requirements; figured dimensions shall govern over scaled dimensions.

Article 32. Co-operation by Contractor.

The Contractor will be given two copies of approved contract drawings, detail sheets, contract and special provisions. He shall have one copy of all such information and a copy of the specifications on the work and available for reference at all times during the prosecution of the work. He shall have at all times a competent and reliable superintendent or foreman on the work, authorized to receive orders and to act for him. Whenever the Contractor is not present on any part of the work when it may be desired to give directions, orders will be given by the Engineer and they shall be received and executed by the foreman or superintendent who is in charge of the particular work in reference to which the orders are given.

The Contractor shall provide all reasonable facilities to enable the Engineer to inspect the workmanship and materials entering into the work. He shall cooperate in the matter of setting and preserving stakes, bench marks, etc., for controlling the work.

The Contractor shall so carry on his work under the direction of the Engineer that public service corporations, or municipal departments may enter on the work to make changes in their structures or to place new structures and connections therewith without interference, and the Contractor shall have no claim for or on account of any delay which may be due to

or result from said work of public service corporations or municipal departments.

Article 33. Adjacent Contracts.

The Contractor shall carry on his work concurrently with that being done on other contracts or work (if any) adjacent to or in conjunction with the project, so as to provide for all possible cooperation towards the satisfactory completion of the work with a minimum of delay and inconvenience. Where necessary and insofar as possible he shall permit other contractors free and unobstructed passage over the work. He shall have no claim for or on account of any damage or delay due to the operations of other contractors or their movements over his section of the work.

Article 34. Construction Stakes.

The Contractor shall furnish, free of charge, all stakes and such temporary structures as may be necessary for marking and maintaining points and lines given by the Engineer for the building of the work, and shall give the said Engineer such facilities and materials for giving said lines and points as he may require; and the Engineer's marks shall be carefully preserved.

Article 35. Authority and Duties of Engineer's Assistants.

The Engineer may appoint such assistants and representatives as he desires and they shall be authorized to inspect work and materials, to give directions pertaining to the work or to the safety and convenience of the public, to approve or reject materials, to make measurements of quantities and to perform such other duties as may be designated by the Engineer.

In case of any dispute arising between the Contractor and the Engineer's assistants, as to materials furnished or the manner of performing the work, the Engineer's assistants shall have the authority to reject the materials or to suspend the work until the question at issue can be referred to and decided by the Engineer.

Engineer's assistants are not authorized to revoke, alter, enlarge, relax or release any requirements of these specifications, nor to issue instructions contrary to the plans and specifications. They shall in no case act as foreman or perform other duties for the Contractor.

Article 36. Inspection of Work and Materials.

The Engineers agents and employees of the Owner may for any purpose enter upon the work and premises used by the Contractor and the Contractor shall provide safe and proper facilities therefor.

The inspection of the work shall not relieve the Contractor of any of his obligations to fulfill the terms of the Contract as herein prescribed by the plans and the specifications.

The Contractor shall furnish the Engineer or his authorized representative with every reasonable facility and assistance for ascertaining whether or not the work as performed is in accordance with the requirements and intent of the plans and specifications. If so directed, the Contractor shall, at any time, before the acceptance of the work, remove or uncover any portions of the finished work necessary for inspection. After the inspection the Contractor shall restore said portions of the work to the condition required by the specifications.

The Contractor shall furnish written information to the Engineer stating the original sources of supply and dates of manufacture of all materials manufactured away from the actual site of the work. In order to insure a proper time sequence for required inspection and approval this information shall be furnished at least two (2) weeks (or otherwise directed by the Engineer) in advance of the incorporation in the work of any such materials.

Failure to reject any defective work or materials shall not in any way prevent later rejection when such defect is discovered, or obligate the owner to make final acceptance.

Article 37. Removal of Defective or Unauthorized Work.

All defective work shall be removed, repaired or made good, notwithstanding that such work has previously been inspected and approved or estimated for payment. If the work or any part thereof shall be found defective at any time before the final acceptance of the whole work, the Contractor shall at his own expense make good such defect in a satisfactory manner.

Any work done beyond the lines and grades shown on the plans or as given, except as herein provided, or any extra work done without authority, shall be considered as unauthorized and at the expense of the Contractor. Such work will not be measured nor compensation allowed therefor. Work so done may be ordered removed at the Contractor's expense.

Upon failure of the Contractor to remove and satisfactorily dispose of any or all defective or unauthorized work, and to remedy the same after being so notified, the Engineer may cause such defective work to be remedied, removed and replaced, and such unauthorized work to be removed; and to deduct the costs therefor, from any moneys due or to become due the Contractor.

Article 38. Final Inspection.

Before any acceptance of the entire project the Engineer will make a complete final inspection of the work done.

If the work or any part thereof is not acceptable to the Engineer at the time of the final inspection, he shall notify the Contractor in writing of the particular defects or parts to be remedied before final acceptance. If the Contractor has not arranged within a period of five (5) days after the date of transmittal of such notice of nonacceptability, to complete the work speedily as described by the Engineer, the Engineer may without further notice and without in any way affecting the contract, make such other arrangements as he may consider necessary to insure the satisfac-

tory completion of the project. The cost of so completing the work shall be deducted from any moneys due or which may become due the Contractor under the contract.

CONTROL OF MATERIALS

Article 39. Source of Supply and Quality.

The source of supply of each material shall be approved by the Engineer before delivery is started.

The Contractor shall furnish all materials required for the work specified in the contract, and said materials shall meet the requirements of the specifications for the kind of work involving their use.

Only new and first quality materials, comforming to the requirements of these specifications and approved by the Engineer shall be used in the work. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product, or if the product from any source proves unacceptable at any time, the Contractor shall furnish approved material from other approved sources.

The Contractor may be required to furnish sworn certificates as to quality and quantity of materials before said materials are incorporated in the work.

Article 40. Samples and Tests.

Tests of materials will be made by the Board or under its direction. The Contractor shall furnish such facilities as the Engineer may require for collecting and forwarding samples, and shall not make use of, or incorporate in the work, any material represented by the samples until the required tests have been made and the material accepted. The Contractor in all cases shall furnish the required samples without charge. Where tests are required of materials already incorporated in the work, the Contractor shall furnish samples, cut from the completed work at a time and as directed by the Engineer. The area affected by the removal shall be replaced and refinished, and the Contractor will receive no special compensation for any of the aforesaid work.

Article 41. Delivery and Storage of Materials.

Materials and equipment shall be progressively delivered at the site so that there will be neither delay in the progress of the work nor an accumulation of material that is not to be used within a reasonable time.

Materials shall be stored at the expense of the Contractor so as to insure the preservation of their quality and fitness for the work. When considered necessary by the Engineer, they shall be placed on wooden platforms or other hard clean surfaces, and not on the ground, and shall be placed under cover when directed. Stored materials shall be so located as to facilitate prompt inspection.

Article 42. Defective Materials.

Materials not conforming to these specifications shall be rejected, and removed from the work by the Contractor as directed. No rejected material, the defects of which have been subsequently corrected, shall be used except with the permission of the Engineer. Should the Contractor fail to remove defective material within the time indicated in writing, the Engineer shall have the authority to remove and replace the defective material, and the cost of such removal and replacement will be deducted from any moneys due or to become due the Contractor.

LEGAL RELATIONS AND CONTRACTOR'S RESPONSIBILITY

Article 43. Laws to be Observed.

The Contractor shall keep himself fully informed of all existing and future state and national laws and municipal ordinances and regulations in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the contract for this work in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same to the Engineer in writing. He shall at all times himself observe and comply with, and shall cause all his agents and employees to observe and comply with, all such existing and future laws, ordinances, regulations, orders and decrees.

The Contractor shall comply with the provisions of Chapter 461 of the Acts of 1935. A table of the minimum wage rates is attached hereto.

The Contractor's attention is directed to the fact that all applicable State and Municipal Laws; and rules and regulations of all authorities having jurisdiction over the construction work in the locality of the project shall apply to the Contract throughout, and they are deemed to be included herein the same as though herein written out in full.

Article 44. Insurance Requirements.

A. Compensation Insurance for Workmen and Traffic Officers:

1. Workmen.

The Contractor shall, before commencing performance of the contract, provide by insurance for the payment of compensation and the furnishing of other benefits under Chapter 149, Section 34A and Chapter 152 of the General Laws, Tercentenary Edition, to all persons to be employed under the contract, and he shall continue such insurance in full force and effect during the term of the contract.

Failure to provide and continue in force such insurance as aforesaid shall be deemed a material breach of the contract and shall operate as an immediate termination thereof.

No cancellation of such insurance, whether by the insurer or by the insured, shall be valid unless written notice thereof is given by the party proposing cancellation to the other party and to the officer or agent who awarded the contract at least fifteen days prior to the intended effective date thereof, which date shall be expressed in said notice. Notice of cancellation sent by the party proposing cancellation, by registered mail, postage prepaid, with a return receipt of the addressee requested, shall be sufficient notice. An affidavit of any officer, agent or employee of the insurer or of the insured, as the case may be, duly authorized for the purpose, that he has so sent such notice addressed as aforesaid shall be prima facie evidence on the sending thereof as aforesaid. This section shall apply to the legal representatives, trustee in bankruptcy, receiver, assignee, trustee and the successor in interest of any such Contractor.

The aforesaid insurance shall be taken out and maintained at the Contractor's own expense.

2. Traffic Officers.

The Contractor shall take out and maintain at his own expense, insurance against damages arising from injury to special uniformed police, referred to in Article 58, while they are engaged in the performance of their duties. The coverage and provisions of such insurance shall be similar to those required to insure employees of the Contractor under the Workmen's Compensation Act, and shall be in addition thereto.

The aforesaid insurance shall be taken out and maintained at the Contractor's own expense.

3. Contractor's Public Liability and Property Damage Liability Insurance.

The Contractor shall furnish evidence to the Board that, with respect to the operations he performs, he carries Contractor's Public Liability Insurance providing for a limit of not less than a monetary value specified in the Special Provisions for all damages arising out of bodily injuries to or death of one person, and, subject to that limit for each person, a total limit of a monetary value specified in the Special Provisions for all damages arising out of bodily injuries to or death of two or more persons in any one accident, and Contractor's Property Damage Liability Insurance providing for a limit of not less than a monetary value specified in the Special Provisions for all damages arising out of injury to or destruction of property in any one accident and, subject to that limit per accident, a total (or aggregate) limit of a monetary value specified in the Special Provisions for all damages arising out of injury to or destruction of property during the policy period.

If any part of the work is sublet similar insurance shall be provided by or in behalf of the subcontractors to cover their operations.

Such property damage and public liability insurance as are provided under this Contract must cover all the various types and items of work that are to be undertaken. For the purposes of this Contract the insurance shall be considered to be in full effect from the date of signing of the Contract to the date of the final acceptance of the work.

Such public liability and property damage insurance as are provided under this contract must carry a clause or rider agreeing to "assume the defense of and indemnify and save harmless the Owner, together with his officers, employees and agents, from all suits, loss, cost or damage arising out of or attributable to claims related to the project."

Satisfactory proof of insurance coverage shall be given to the Owner. Three copies of the insurance certificate shall be furnished prior to the signing of the Contract. A complete policy will be furnished to the Engineer before the beginning of construction operations.

Failure to provide and continue in force, the property damage and public liability insurance during the life of this Contract shall be deemed a breach of the Contract and shall operate as an immediate termination thereof.

The aforesaid insurance shall be taken out and maintained at the Contractor's expense.

Article 45. Working Hours.

No laborer, workman, mechanic, foreman or inspector working within the Commonwealth, in the employ of the Contractor, sub-contractor, or other person doing or contracting to do the whole or a part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty-eight hours in any one week, or more than six days in any one week, except in cases of emergency. Any contractor or sub-contractor for said department, may employ laborers, workmen, mechanics, foremen and inspectors for more than eight hours in any one day in such construction or reconstruction when, in the opinion of the commissioner of labor and industries, public necessity so requires.

Article 46. Rules for Employment of Labor.

The Contractor and all sub-contractors shall keep a true and accurate register of all mechanics, teamsters, chauffeurs and laborers employed thereon, showing the name, address, and occupational classification of each employee on said works, and the hours worked by, and the wages paid to each such employee, and shall furnish to the Massachusetts Department of Labor and Industries upon its request a true statement of the same. Such records shall be kept in such manner as the Commissioner of Labor and Industries shall prescribe, and shall be open to inspection by any authorized representative of the Department of Labor and Industries at any reasonable time and as often as may be necessary.

In the employment of mechanics, teamsters, chauffeurs, and laborers in the construction of public works by persons contracting or subcontracting for such works, preference shall first be given to citizens of the Commonwealth who have served in the army or navy of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally, and, if they cannot be obtained in sufficient numbers, then to citizens of the United States. Every employee in the work covered by the contract shall

lodge, board and trade where and with whom he elects, and neither the Contractor nor his agents or employees shall directly or indirectly require as a condition of employment therein that an employee shall lodge, board or trade at a particular place or with a particular person. Attention of bidders is called to Section 148 of Chapter 149 of the General Laws, and acts in amendment thereof which require the weekly payment of employees.

Article 47. Permits and Licenses.

The Contractor shall procure at his own expense all permits and licenses, pay all charges and fees and give all notices necessary and due in connection with the lawful prosecution of the work.

Article 48. Patented Devices, Materials and Processes.

Whenever the Contractor desires to use any design, device, material, or process covered by letters patent or copyright, the right for such use shall be secured by suitable legal agreement with the patentee or owner, and a copy of this agreement shall be filed with the Owner.

Article 49. Sanitary Provisions.

The Contractor shall provide and maintain in a neat and sanitary condition such accomodations for the use of his employees as may be necessary to comply with the requirements of the Department of Public Health, local health officials or of other authorities having jurisdiction.

Article 50. Public Safety and Convenience.

The Contractor shall be responsible for the maintenance of traffic over, through or around the work included in his contract with the maximum of safety and practicable convenience to such traffic during the life of the contract, and whether or not work thereon has been suspended temporarily. He shall take all precautions for preventing injuries to persons or damage to property in or about the work. If the Contractor constructs temporary bridges or provides temporary crossings of streams, his responsibility for accidents shall include the roadway approaches as well as the structures of such crossings.

The work shall be carried on in such a manner as to provide safe passage at all times for public travel and with least obstruction to traffic. The convenience of the general public and of residents along and adjacent to the project shall be provided for in an adequate and satisfactory manner. The Contractor shall provide and maintain at his own expense (except as otherwise provided herein) in a safe and passable condition, such temporary by-passes and temporary bridges as may be necessary to accomodate traffic on and around the construction; and he shall provide and maintain, in a safe condition, temporary approaches to and crossings of intersecting highways.

Roads shall be closed to travel only as directed by the Engineer. Where the new construction coincides with the present traveled way, the Contractor shall so carry on his work that travel will not be obstructed.

The Contractor shall at all times so conduct the work that the abutters shall have reasonable access to their property as directed by the Engineer. When it is necessary to leave materials and equipment upon the highway they shall be placed so as to cause the least possible obstruction to pedestrians and other travel.

Work shall be carried on in such a manner as to provide for reasonable fire protection at all times.

When the work in any way affects the operation, management, maintenance, business or traffic on any railroad, such work shall be carried on in a manner satisfactory to the said railroad. The Contractor shall use all possible vigilance in order effectually to guard against all accidents or damages on the railroad due to his work, and the Contractor shall at all times during the progress of the work so manage and execute the same as to cause the least possible interference with the operation, management, business or traffic of the railroad.

In the event that the Contractor fails to comply with the provisions of this Article, then the Owner shall proceed to make such required improvements, detours, by-passes, etc., as he believes necessary. The Owner shall, at his own discretion, either proceed with said work immediately or after a suitable time limit specified in a notice to the Contractor. The cost of said work will be borne by the Contractor.

Article 51. Barricades, Warning Signs and Lights.

The Contractor shall at his own expense provide, place and erect all necessary barricades and warning signs and furnish and keep lighted all lights necessary to protect the work from traffic, pedestrians and animals. He shall also furnish at his own expense a sufficient number of watchmen at all times to protect the work.

Highways closed to traffic shall be protected by suitable barricades and warning signs, and the Contractor shall provide and maintain adequate lights and illumination therefor. He shall be held responsible for all damage to the work due to any failure of signs and barricades to protect the work properly from traffic, pedestrians, animals or other causes.

In the event that the Contractor fails to comply with the provisions of the Article, then the Owner shall proceed to make such required improvements, detours, by-passes, etc., as he believes necessary. The Owner shall, at his own discretion, either proceed with said work immediately or after a suitable time limit specified in a notice to the Contractor. The cost of said work will be borne by the Contractor.

Article 52. Protection and Restoration of Property.

The Contractor shall, at his own expense, preserve and protect from injury all property either public or private along and adjacent to the project, and he shall be responsible for and repair at his own expense any and all damage and injury thereto. He shall exercise special care during

his operations to avoid injury to underground structures such as water or gas mains, pipes, conduits, manholes, catch basins, etc. When necessary, the Contractor shall cooperate with representatives of public service companies in order to avoid damage to their structures by furnishing and/or erecting suitable supports, props, shoring or other means of protection.

Fire hydrants adjacent to the work at all times shall be readily accessible to fire apparatus and no material or other obstructions shall be placed within a radius of ten (10) feet of a fire hydrant.

Land monuments and property marks shall be carefully protected and if necessary to remove the same, he shall do so only at the Engineer's direction and after an authorized agent has witnessed or otherwise referenced their location. The Contractor shall not injure or remove trees or shrubs without proper authority. Insofar as possible the Contractor shall confine his movements and operations to the area within the limits of the location and the area outside the scope of the work shall not be disturbed except as directed.

Article 53. Responsibility for Damage Claims.

The Contractor shall take all responsibility for the work and take all precautions for preventing injuries to persons and property in or about the work; shall bear all losses resulting to him on account of the amount or character of the work, or on account of the weather elements or other causes, and the Contractor shall indemnify and save harmless the Owner and all of its officers, agents and employees against all suits, claims or liability of every name and nature, arising out of or in consequence of any acts of omission or neglect of the Contractor in the performance of the work covered by the contract and/or failure to comply with the terms and conditions of said contract, whether by himself or his employees or subcontractors.

Damage to materials furnished by the Owner or damage to the Owner's property, either now existing or constructed under this Contract, and all loss or deterioration occurring prior to the final acceptance of the work, and resulting from the Contractor's operations, shall be made good by the Contractor at no expense to the Owner.

Article 54. Contractor's Responsibility for the Work.

Until its final approval by the Owner, the Contractor shall assume full charge and care of the work and he shall take every necessary precaution against injury or damage to the work by action of the elements, or from any cause whatsoever, whether arising from the execution or the non-execution of the contract. The Contractor shall bear all losses resulting to him on account of the amount or the character of the work, or because the nature of the land in or on which the work is done is different from what was estimated or expected, or on account of the weather elements, or other causes.

The Contractor shall rebuild, repair, restore and make good at his own expense, all injuries or damages to any portion of the work occasioned by any of the above causes before the completion of the work and the accep-

tance of the contract. Issuance of an estimate on any part of the work done shall not be construed as final acceptance of any work completed up to that time.

The Contractor shall reimburse the Owner for all expenses, losses or damages, as determined by the Engineer, incurred by or in consequence of any defect, act, omission, or mistake of the Contractor or his employees.

The Contractor will be held responsible for any and all claims for damage to underground structures such as water or gas mains, pipes, conduits, manholes or catch basins, due to his operations or to the operations of any of his sub-Contractors.

Locations shown for existing underground pipes and utilities are approximate only, as determined from records, M-Scope surveys and field observations. The Contractor shall have no claim if any utility or pipe-line is not shown in correct location or is present but not shown on the plans. The Contractor shall be responsible for notifying utility owners in reasonable advance of his work and he shall request of the utility owner, the staking out on the ground surface, of underground utilities and structure. The Contractor shall notify the Engineer, of any refusal or failure to stake out utilities after reasonable notice, and the Engineer and the Contractor will jointly take reasonable action to determine the location of the utilities before the beginning of excavation.

The Contractor shall contact all utility owners to determine if they have any buried pipes, cables, objects, etc. in the area of his work. Gas, Electric, gasoline, Telephone, Radio, water, Telegraph, oil, natural gas, Sewers, drains, fire alarm, ADT, etc. shall all be considered utilities herein.

Article 55. Claims Against Contractors.

The Contractor shall pay all bills for labor and materials contracted by him and for the rental of appliances and equipment hired by him for or on account of the work herein contemplated. The Owner may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefore, to the payment of any expenses, losses or damages incurred by the Owner and determined as herein provided, and may retain, until all claims are settled, so much of the moneys as the Owner shall be of opinion will be required to settle (1) all claims against the Owner and its officers and agents as specified in Article 53 and 54, and (2) all claims for labor performed or furnished, for materials used or employed in such construction or repair, including lumber so employed which is not incorporated in the construction or repair work and is not wholly or necessarily consumed or made so worthless as to lose its identity but only to the extent of its purchase price less its fair salvage value, and for the rental or hire of vehicles, shovels, Excavating and Backfilling equipment rollers propelled by steam or other power, concrete mixers, tools and other appliances and equipment employed, said claims having been filed with the County Treasurer or City or Town Clerk, in accordance with Section 29, Chapter 149 of the General Laws, as appearing in the Tercentenary Edition, as amended by Chapter 361 of the Acts of the year 1938, and all subsequent amendments thereto, or the Owner may make such settlements and apply thereto any moneys retained under the contract. If the moneys retained under the contract are insufficient to pay the sum due under the claims for labor and materials and for the rental of appliances and equipment filed as aforesaid,

the Owner may, at its discretion, pay the same, and the Contractor shall repay to the Owner all sums so paid. The Owner may also, with the written consent of the Contractor, use any moneys retained, due or to become due under the contract, for the purpose of paying for labor and materials and for the rental of appliances and equipment for the work for which claims have not been filed as specified above. It is understood that the security required by Section 29 of Chapter 149 of the General Laws, Tercentenary Edition, is obtained both by the bond accompanying the contract and by the power of the Owner to retain and pay money under the provisions of this article, but the release of one shall in no way impair or discharge the other.

Article 56. No Waiver of Legal Rights.

Neither the inspection by the Owner nor any of its employees or agents, nor any order, measurement or certificate by the Engineer, nor any order by the Owner for the payment of money, nor any payment for, or acceptance of, the whole or any part of the work by the Engineer or Owner, nor any extension of time, nor any possession taken by the Owner or its employees, shall operate as a waiver of any provision of the contract, or of any power herein reserved to the Owner or any right to damages herein provided; nor shall any waiver or any breach of the contract be held to be a waiver of any other or subsequent breach. Any remedy provided in the contract shall be taken and construed as cumulative, that is, in addition to each and every other remedy, herein provided; and the Owner shall also be entitled as of right to a writ of injunction against any breach of any of the provisions of the contract.

Article 57. Use of Explosives.

When the use of explosives is necessary for the prosecution of the work, the Contractor shall observe the utmost care not to endanger life and property, and whenever directed, the number and size of the charges shall be reduced. All explosives shall be stored in a secure manner and all such storage places shall be marked clearly "DANGEROUS - EXPLOSIVES," and shall be in the care of competent watchmen at all times. The method of storage and handling explosives and highly inflammable materials shall conform with all the State laws and regulations, as well as any local requirements.

Prior to blasting, the Contractor shall serve reasonable notice thereof to the operating official or company, or companies, leasing or owning pipes, conduits, poles, wires, etc., in danger of being injured by the blasting in order that a representative of said owner or lessees may be present at the site, and he shall take proper precaution to prevent such injury by the use of sufficient dunnage.

No blasting shall be attempted until sufficient warning has been given to all persons in the vicinity of the work.

The cost of additional bond or insurance, if any, required by the Owner and/or his agents, or by other duly authorized officials, shall be borne by the Contractor. No extra compensation will be paid the Contractor for the additional risk involved in blasting, for the additional cost of the extreme precautions required for safe blasting or for the additional cost of bonds or insurance required.

Article 58. Traffic Officers and Flagmen.

When in the opinion of the Owner it is necessary that special uni-

formed police be used to direct traffic, he may request the Contractor to obtain, in addition to the usual employees of the Contractor, a reasonable number of special uniformed police, and the Contractor shall obtain and furnish such men. These special uniformed police shall at all times be subject to the direction and control of the Contractor.

To reimburse the Contractor for this additional expense, the Owner will pay to the Contractor, in addition to the contract prices, the cost of such special uniformed police, such cost to include the actual wages paid by the Contractor to such police plus his expenses due to the requirements of the Federal Social Security Act, and the Massachusetts Unemployment Compensation Act and the cost of insurance required under Article 44 to insure said police as herein required.

The Contractor shall pay to any reserve police officer employed by him the prevailing rate of wages paid to regular police officers in such city or town. (C. 149 General Laws, Ter. Ed. as amended by C. 252 of the Acts. of 1939.)

When any work is being done by the Contractor which may obstruct the tracks of a railroad or in any way endanger the running of trains, a flagman or flagmen, designated by the Chief Engineer of the railroad shall be on duty for the protection of the property and traffic of the railroad.

The expense for all flagging service which is required shall be assumed by the Contractor and included in the prices bid for the various items for work to be performed under this contract.

Article 59. Temporary Use of Work.

Any portion of the work which is in an acceptable condition for use may be opened for use as directed and such opening for use shall not be construed as an acceptance of the work, or part thereof, nor shall it act as a waiver of any of the provisions of these specifications and the contract. The Contractor shall make at his own expense any and all necessary repairs or renewals to the work due to said opening for use under instructions from the Engineer, as well as to defective materials and work, natural causes, to ordinary wear and tear or otherwise, preceding completion and acceptance of the work. Completed sections of the work shall be maintained by the Contractor in an acceptable manner, until the final acceptance of the contract. He shall not permit use of any portion of the work unless so authorized by the Engineer.

PROSECUTION AND PROGRESS

Article 60. Subletting or Assignment of Contract.

The Contractor shall give his personal attention constantly to the faithful prosecution of the work, shall keep the same under his personal control, and shall not assign by power of attorney or otherwise, or sublet the work or any part thereof without the previous written consent of the Owner and shall not, either legally or equitably, assign any of the moneys payable under this agreement, or his claim thereto, unless by and with the like consent of the Owner. He shall be responsible for the acts and omissions of his sub-Contractors, if any, and of all persons directly or indirectly employed by him or them in connection with the work.

The Contractor shall comply with the provisions of Section 179A of Chapter 149 of the General Laws, relative to giving such preference to citizens in awarding contracts for public work as is therein provided.

Article 61. Schedule of Operations.

Before commencing work, the Contractor shall, if required, submit a schedule of operations for approval by the Engineer. The schedule shall show the methods and order of operations that the Contractor proposes to use. The approval of the schedule by the Engineer shall not be construed as relieving the Contractor from any responsibility.

Article 62. Prosecution of Work.

The Contractor shall commence work within seven (7) calendar days after the execution of the contract, or within such other period as the Engineer shall authorize in writing, (approved by the Owner) at such points as the Engineer may direct, and he shall thereafter prosecute the work at such points and in such order as the Engineer may from time to time prescri

Should the prosecution of the work for any reason be discontinued, the Contractor shall notify the Engineer at least twenty-four (24) hours in advance of resuming operations.

It is the purpose of the Owner to complete the work in the shortest time possible and consistent with approved construction. To this end, Contractors will be required to use improved methods and equipment for doing the work and various parts thereof. All equipment shall be complete and well designed, and the organization shall be effecient and effective.

If, in the opinion of the Engineer, it is necessary at any time, the Contractor shall, when directed, employ such forces and equipment for one or more additional shifts as will be required to insure the proper completion of the work. The Contractor shall provide and maintain, including power or fuel, sufficient lights for the safety of his construction forces and to ensure the proper construction, inspection and prosecution of the work; in addition to any lights necessary to protect the work or the public. The Contractor shall not receive any compensation therefor in addition to the contract unit prices.

The Contractor shall work diligently and steadily on the work, and when ordered in writing by the Engineer to either begin work again or to increase personnel and equipment on the work to speed up progress, the Contractor fails so to do within 5 calendar days, the Contractor shall ge considered to have abandoned the job and the Bonding Company shall be notified to complete the work or forces and equipment shall be engaged by the owner to complete the work as per conditions herein.

Article 63. Delay in Commencing Work.

The Owner may delay the commencing of the work, or any part thereof, if the Owner shall deem it best for its interests to do so. The Contractor shall have no claim for damages on account of such delay, but shall be entitled to an equivalent extension of time in which to complete the whole

or any portion of the work required under the Contract. The Contractor shall have no claim for damages on account of any delay on the part of the Owner in performing or furnishing any work or materials to be performed or furnished by the said Owner in connection with the execution of the work covered by the contract.

Article 64. Limitations of Operations.

The Contractor shall so limit his operations and carry on his work in such manner and sequence as to insure the least possible interference with traffic and abutters.

The Owner reserves the right to limit the prosecution of the work to such points and in such order as the Engineer may direct.

Article 65. Character of Workmen.

The Contractor shall employ only competent men to do the work, and whenever the Engineer shall notify the Contractor in writing that any man on the work is, in his opinion, incompetent, unfaithful, disorderly or otherwise unsatisfactory, such man shall be discharged from the work, and shall not again be employed on it except with the consent of the Engineer.

Article 66. Temporary Suspension of Work.

The Engineer shall have the authority to suspend the work wholly or any part thereof, for such periods as he shall deem necessary, because of unsuitable weather conditions, or failure to complete adjacent contracts, or to provide time for moving of utilities, or for such other causes as are considered unfavorable for the satisfactory prosecution of the work, or for such time as he may deem necessary due to the failure of the Contractor to carry out orders given or to perform any provision of the contract. Upon receipt of written order from the Engineer, the Contractor shall immediately suspend work or such part thereof in accordance with the order. No work shall be suspended without the written permission of the Engineer. The work shall be resumed when conditions so warrant or deficiencies have been corrected and the conditions of the contract satisfied as ordered or approved in writing by the Engineer. No allowance of any kind will be made for suspension of work by order of the Engineer, except for an extension of time equal to the period of suspension.

Article 67. Failure to Complete Work on Time.

On or before the date stated in the proposal for completion, the whole work shall have been performed in accordance with the terms of the contract. The time in which the various portions and the whole of the contract are to be performed and the work is to be completed is an essential part of the contract.

In case the work embraced in the contract shall not have been completed by the time stipulated therein (according to the foregoing requirements) the Contractor shall reimburse to the Owner a sum of money equal to the amount that the Owner is required to spend as a result of the delay in completion of the work. This amount shall include the cost of engineering and inspection on the work for the period of time overrun.

The Engineer is to constitute an adjudicator in regard to this Article of the Contract. He is to determine the cost or loss suffered by the Owner as a result of the delay in completion of the work.

Whatever the sum of money may become due and payable to the Owner by th Contractor under this article may be retained out of money belonging to the Contractor in the hands and possession of the Owner; and it is agreed that this article is to be construed and treated both by the parties to the contract and by all courts of law or equity, not as imposing a penalty upon said Contractor for failing fully to complete said work as agreed on or before the time specified in the Proposal, but as liquidated damages to compensate said Owner for all damages actually suffered because of the failure of the Contractor fully to complete said work on or before the date of completion specified in the Proposal.

Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, shall in nowise operate as a waiver on the part of the Owner of any of its rights under the contract.

Article 68. Annulment of Contract.

If the Contractor shall be adjudged a bankrupt, or if he shall make a general assignment for the benefit of his creditors, or if a receiver of his property shall be appointed, or if the work to be done under the contract shall be abandoned, or if the contract or any part thereof shall be sublet without the previous written consent of the Owner, or if the contract orany claim thereunder shall be assigned by the Contractor otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so cerfity in writing to the Owner that the work, or any part thereof, is unnecessarily or unreasonably delayed, or that the Contractor has violated any of the privisions of the contract, the Owner may notify the Contractor to discontinue all work, or any part thereof; and thereupon the Contractor shall discontinue such work, or such part thereof as the Owner may designate, and the Owner may thereupon, by contract or otherwise, as it may determine, complete the work, or such part thereof, and charge the entire expense of so completing the work or part thereof to the Contractor; and for such completion the Owner for itself or its agents may take possession of and use or cause to be used in the completion of the work or part thereof of any such materials, animals, machinery, implements and tools of every description as may be found upon the line of said work. The Owner shall not be liable for any depreciation, loss or damage to said materials, animals, machinery, implements or tools during said use, nor until removed by the Contractor after completion of the work. Unless so removed within fifteen (15) days after mailing of notice so to do, they may be sold at public auction, after publication of notice thereof at least twice in any newspaper published in the City or Town, and the proceeds credited to the Contractor's expense subject to a lien for the storage charges.

If the engineer shall certify that the rate of progress is not satisfactory the Owner may, instead of notifying the Contractor to discontinue all work or any part thereof, notify him from time to time to increase the force, equipment and plant, or any of them, employed on the whole or any part of the work, stating the amount of increase required; and unless he shall within five (5) calendar days after any such notice, increase his force, equipment and plant to the extent required therein, and maintain and

employ the same from day to day until completion of the work or such part thereof or until the conditions as to the rate of progress shall, in the opinion of the Engineer, be fulfilled, the Owner may employ and direct the labors of such additional force, equipment and plant as may, in the opinion of the Engineer, be necessary to insure the completion of the work or such part thereof within the time specified, or at the earliest possible date thereafter, and charge the expense thereof to the Contractor. Neither the notice from the Owner to the Contractor to increase his force, equipment or plant; nor the employment of additional force, equipment or plant by the Owner shall be held to prevent a subsequent notice from the Owner to him to discontinue work under the provisions of the preceding portion of this article.

All expenses charged under this article shall be deducted and paid by the Owner out of any moneys then due or to become due the Contractor under the Contract, or any part thereof; and in such accounting the Owner shall not be held to obtain the lowest figures for the work of completing the contract or any part thereof, or for insuring its proper completion, but all sums actually paid therefor shall be charged to the Contractor. In case the expenses so charged are less than the sum which would have been payable under the contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case such expenses shall exceed the said sum, the Contractor shall pay the amount of the excess to the Owner upon completion of the work, without further demand being made therefor.

MEASUREMENT AND PAYMENT

Article 69. Measurement of Quantities.

The quantities of the various items of work performed shall be determined by the Engineer.

Upon the completion of the work and before final payment is made, the Engineer will make final measurement to determine the quantities of the various items of work performed, as the basis for final settlement. All measurements shall be made according to the United States standard units of measurements.

All materials which are specified for measurement by weight shall be weighed on standard scales furnished by and at the expense of the Contractor. Such scales shall be sealed at the expense of the Contractor as often as is necessary to insure their accuracy. A sworn weigher to be appointed and compensated by the Owner shall weigh all materials required to be weighed as above provided. If materials are shipped by rail or trucks, the car weights or quarry weights may be accepted, but scales shall be used as above, if so directed.

Article 70. Scope of Payments.

The Owner will pay and the Contractor shall receive and accept the compensation as herein provided, in full payment for the furnishing of all materials, labor, tools and equipment and for performing all work contemplated and embraced under the contract, also for all loss or damage arising out of the nature of the work, or from the action of the elements, or from any unforseen difficulties or obstructions which may arise or be encoun-

tered during the prosecution of the work and until its final acceptance by the Owner, and for all risks of every description connected with the prosecution of the work, also for all expenses incurred by, or in consequence of the suspension or discontinuance or the said prosecution of the work as herein specified, and for any infringement of patent, trade-mark or copyright, and for completing the work in an acceptable manner according to the plans and specifications.

The payment of any current estimate, or of any retained percentage shall in no way constitute an acknowledgement of the acceptance of the work or in no way or degree prejudice or affect the obligation of the Contractor, at his own cost and expense, to repair, correct, renew or replace any defects and imperfections in the construction of, or in the strength of, or quality of materials used in or about the construction of the work under contract and its appurtenances, as well as all damages due or attributable to such defects; which defects, imperfections or damages shall have been discovered on or before the final inspection and acceptance of the work. The Engineer shall be the sole judge of such defects, imperfections, or damages and the Contractor shall be liable to the Owner for failure to correct the same as provided herein.

Article 71. Payment for Increased or Decreased Quantities.

An increase in quantities of work to be performed (as set forth in Articles 3, 22 and 23) will be paid for at the contract unit price for the actual work done, in the same manner as if such work had been included in the original estimated quantities. No allowance will be made for anticipated profits or underruns in quantities.

Changes involving extra work will be paid for according to the method stipulated in the extra work orders.

Article 72. Omitted Items.

The Engineer may order omitted from the work any items or portions of the work found unnecessary to the improvement and such omission shall not operate as a waiver of any condition of the contract nor invalidate any of the provisions thereof, nor shall the Contractor have any claim for anticipated profit.

Article 73. Payment for Extra Work.

Extra work will be paid forlin accordance with the accepted and approved extra work orders according to procedures outlined in Articles 22 and 23.

The determination of the Engineer shall be final upon all questions pertaining to the amount and value of extra work performed.

In making any change contemplated, the charge or credit for the change shall be determined by the Owner in one of the following methods prior to the issuance of the order for the changed work:

(1) The order shall fix the total lump sum cost of the change in the work as mutually agreed on between the Owner and the Contractor and shall set out such cost as the amount to be added to or deducted from the contract amount by virtue of the change in the work. The cost as above shall include the Contractor's overhead and profit except that in any change which involves a net credit to the Owner, no allowance for overhead and profit shall be figured.

(2) By estimating the number of unit quantities of each part of the work which is changed and then multiplying the estimated number of such unit quantities by the price (which price shall include the Contractor's overhead and profit) for a unit quantity thereof. Unit prices refer to unit prices bid herein. In the event there are no unit prices in the Proposal that are applicable, the Owner and the Contractor may work out a mutually agreeable unit price. The Engineer shall determine whether or not the unit prices in the Proposal are applicable to the extra work under consideration.

(3) By ordering the Contractor to proceed with the work and to keep and present in such forms as the Owner may direct, a correct account of the cost of the change together with all vouchers therefor. The cost may include a lump sum allowance (fixed fee) for profit and overhead and 10%. The Contractors labor costs may be increased by the cost of the various health, welfare and liability insurance he is required to carry. The Contractors total actual cost may be increased by the cost of his Performance Bond.

In figuring changes, the instructions for measurement of quantities set forth in the Special Provisions and Specifications shall be followed insofar as possible. Items such as shovels, picks, small tools, manual equipment, melting pots, etc., shall be considered as part of the Contractor's overhead. Timekeepers, superintendents and office employees shall be considered as a part of the Contractor's overhead.

For machinery, trucks and equipment a standard rental allowance shall be charged. A reasonable rental allowance determined by the Engineer based on published rates and reasonable rental periods shall be used. If a piece of equipment used on extra work for a short period of time (hours or days) is on the job, or has previously been rented, for a long period of time (months) then the long term rental rate shall be used in determining costs.

In the case of any Extra Work ordered by the Owner and completed by a Sub-Contractor on the Project, the General Contractor will be allowed to increase the Sub-Contractor's cost to him by 5% to cover bookkeeping costs, overhead, etc. In determining costs, the Sub-Contractor is to use one of the three methods described herein above.

Article 74. Partial Payments

The Engineer shall, once in each month, make an estimate in writing of the total amount of the work done to the time of such estimate and the value thereof. The Owner shall retain ten per cent (10%) of such estimated value as part security for the fulfillment of this contract by the Contractor, and shall pay monthly to the Contractor while carrying on the work the

balance not retained as aforesaid, after deducting therefrom all previous payments and all sums to be kept or retained under the provision of this contract.

No such estimate or payment shall be required to be made when, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the contract, or when in his judgment the total value of the work done since the last estimate amounts to less than three hundred (300) dollars.

The Owner may, if it deems it expedient so to do, cause estimates to be made more frequently than once in each month, and it may cause payments to be made more frequently to the Contractor. The Owner may at its option retain, temporarily or permanently, a smaller amount than as aforesaid, and may cause the Contractor to be paid, temporarily or permanently, from time to time such portions of the reserves as it deems prudent.

The Owner may also allow partial payment on such materials and/or items delivered on the site of the work but not considered as erected or complete in place (for which the ordinary payment as specified above would place) but for which, in the judgment and opinion of the Engineer, the Contractor shall be allowed a partial compensation, due to the fact that the scheduled completion of such materials and items has been hindered and delayed by either temporary closing of the project or by such other causes over which the Contractor has no control. The amount of such partial payments will be determined by the Engineer but in no case shall it exceed seventy per cent (70%) of the contract unit price.

The Owner may increase the retained percentage as security for claims or costs incurred under Articles 55, 62, 67 and 68 or any other section of the Contract.

Article 75-A. Acceptance and Final Payment.

The Engineer shall, as soon as practicable after the satisfactory completion of the contract, make a final estimate of the amount of work done thereunder and the value of such work, and the Owner shall, within sixty-five (65) days from and after the day the work has been approved by the Owner, forward to the Contractor a copy of the final estimate together with an agreement form for his acceptance. After such acceptance has been filed with the Owner payment of the entire sum will be made, so found to be due thereunder after deducting therefrom all previous payments and all amounts to be kept and all amounts to be retained under the provisions of the contract. All prior estimates and payments shall be subject to correction in the final estimate and payment.

Article 75-B. Final Cleaning up of Job.

On completion of the work to be done under this Contract and before final acceptance of the work, the Contractor shall clean up the job, so that the condition of the site will be at least equal to its condition before the work began.

If necessary, the Contractor shall spade up or harrow all trench surfaces and grade and rake same, clean up all papers, trash and stones and leave premises broom clean.

The Contractor shall make good any defect discovered on any of the pipelines, valves or castings, as well as hydrants and hydrant branches that become evident within one (1) year of the date of acceptance of the work by the Town. The cost of repairs necessary shall be borne entirely by the Contractor. This same guarantee applies to the excavation and backfill of trenches, to pavement areas, road shoulders, lawn areas, etc.

Article 75-C. Section 39F of Chapter 30. (Chap. 677 Acts 1956).

Within ten days after the general contractor receives payment on account of a periodic estimate of the value of the work done, he shall pay to each subcontractor the sum contained therein for the value of said subcontractor's work, less any amount retained therefrom by the awarding authority under the terms of the general contract or in consequence of any legal proceedings or statutory liens, and less any amount due the general contractor under the subcontract. Not later than the sixty-fifth day after each subcontractor fully completes his portion of the work in accordance with the plans and specifications, the entire balance due under the subcontract shall be due the subcontractor and shall be paid to the general contractor by the awarding authority for the account of the subcontractor and in partial payment of the amount due under the general contract; provided, however, that the awarding authority may withhold from such partial payment all amounts retained by the awarding authority pending its determination that said portion of the work is satisfactory or in consequence of any legal proceedings or statutory liens. The general contractor shall forthwith pay to the subcontractor the full amount received as aforesaid from the awarding authority for the account of such subcontractor less any amount due the general contractor under the subcontract; and the awarding authority may take such steps as it may deem necessary to arrange that such amounts are paid by the general contractor to the subcontractor forthwith. If, within ten days after the aforementioned sixty-fifth day, the subcontractor has not received from the general contractor the entire balance due on the subcontract less the aforesaid amounts, the subcontractor shall give the awarding authority and the general contractor written notice of such failure to receive payment and of the amount so payable, but not paid, by the general contractor. Thereupon the awarding authority shall make, out of sums payable to the general contractor on the general contract, direct payment to the subcontractor of the entire balance due on the subcontract less the aforesaid amounts. Such direct payment by the awarding authority to any subcontractor and any payment to a general contractor for the account of a subcontractor as hereinbefore provided shall discharge the obligation of the awarding authority to the general contractor to the extent of such payment.

Article 75-D. Contractor's Responsibility; Patents, Equipment, etc.

"The Contractor shall save and hold the Owner harmless from all loss, cost, damage or expense that it may be put to by reason of any alleged infringements of any patent, or patents, covering the manufacture, installation or use of any part of the apparatus or equipment, or any machinery or mechanism or part of thing installed or used, or installed for the purpose of use in the work hereinafter contemplated. The Contractor does further agree that the

Owner shall not be disturbed in the use or operation or installation of the work or equipment herein contemplated by litigation based upon such alleged infringements, and the Contractor does hereby further agree that at its own expense it will defend any and all suits or proceedings for infringement, or otherwise, that may be brought or instituted by any party, persons, companies or corporations against the said Owner for alleged infringement or infringements of any patent or patents. Notice of such action or of any action under infringement proceedings shall be served on the Contractor at its address in writing by registered mail by the Board. Said Contractor shall then be required, through counsel to assume the defense of and to defend same at his own expense."

SPECIAL

PROVISIONS

HAMPDEN COUNTY
APPROVED
OCT 23 1957

County Commissioners



TIGHE & BOND

CONSULTING ENGINEERS

HOLYOKE, MASS.

SPECIAL PROVISIONS

Article 76 Scope of the Work The general outline and details of the proposed work are shown on a set of plans containing sheets and entitled:

"REPAIRS TO
BEMIS POND DAM
PLAYGROUND COMMISSION
CHICOPEE, MASS.

Tighe & Bond, Consulting Engineers
Holyoke, Mass.

Scale: as shown June, 1957"

Further details of the work and the various items and proposals required in the work will be found in the General Requirements, Special Provisions, Standard Details, and the Plans, all of which are a part of the contract document.

The Contractor is to furnish all plant, labor, materials, equipment, supplies, insurance and other factors necessary or proper for the carrying out of the work contemplated under this contract. Work performed and the materials furnished are to be in strict accordance with the applicable plans and specifications and addenda.

Work consists of furnishing all labor, tools, equipment and materials necessary to construct a reinforced concrete discharge conduit thru the dam, and a drop-inlet type spillway or intake structure, and to repair and improve the concrete walls forming the present spillway and footbridge abutments, and to restore the earthen dam, all as shown on the plans and as described in detail herein.

Article 77 Proposal Guaranty Bidder is to furnish with his proposal a certified check or cash in the amount of $1,000 drawn upon a bank or trust company in the Commonwealth of Massachusetts and payable to the City of Chicopee, Massachusetts.

Article 78 Contract Bond The successful bidder is to furnish to the owner a performance and a labor and materials payment bond in the full amount of the contract for the faithful performance and full payment of all the work required or labor and materials furnished under this contract.

Article 79 Insurance Requirements In accordance with Article 44 of the General Requirements, the Contractor is to furnish the following insurance:

Public Liability	$100,000-$300,000
Property Damage	$25,000-$50,000

The Contractor is warned to read carefully and to have his insurance company read carefully the provisions of Article 44, which must be complied with.

Article 80 Special Conditions The Contractor's attention is called to the following:

1. Work under this contract is to be substantially completed so as to permit the storing of water within 60 calendar days from the date of award of the contract.

2. The proposal has been divided into three (3) lump sum items and several unit priced items and each item is to be considered as a complete unit in itself without relation to the other items. The Contractor is warned not to unbalance his bid, and that the City may increase, decrease, or delete completely any of the items, in which case the Contractor shall not be entitled to any change in his unit prices, nor to any consideration or payment for profits which he may have anticipated for items deleted.

3. The entire area in which work is to be carried out under this contract shall be closed to pedestrian traffic. The Contractor shall erect and maintain neatly painted fences across the present walk-way with signs indicating that the area is closed. Such fences shall be permanently erected before work is begun, and shall be maintained by the Contractor until all work has been completed. Fences shall be of a style approved by the Engineer. Lights shall be maintained at each fence during all hours of darkness. A gate equipped with a lock may be included in the fence, to provide access to the area. The gate shall be kept securely locked by the Contractor at all times when the gate opening is not required for access to the work area.

   Neatly painted and lettered signs shall be erected and maintained by the Contractor at one location on each side of the work designated by the Engineer to warn pedestrians that the walk-way across the dam is closed.

4. There is a brook, which drains the upstream area, that flows thru the project site. The Contractor at all times shall provide for this flow thru the work, and he shall anticipate flood flows which could greatly increase the flow in this brook. Expressly included in Item 1 is any work required for the proper control of the brook and or ground water. The control shall be basically obtained thru the installation of a temporary pipe. The Contractor shall advise the Engineer, in advance of starting work, the method he proposes to use for this purpose, and only a system satisfactory to the Engineer shall be used.

   The Contractor shall exercise unusual care to protect the earthen base upon which structures are to be placed from washing out or from being softened by excess water, and in the event washouts or excess softening of the material occurs, the Contractor shall restore the base so disturbed in a manner prescribed by the Engineer without additional compensation.

Article 81 Material Furnished by the Owner No materials will be furnished by the Owner for this project.

The Contractor may re-use material excavated from the existing earthen dam, provided that all stones exceeding six (6") inches in their largest dimensions; top-soil and vegetation including stumps or roots; and all concrete and bricks are removed before placing the material in sections of the embankment not requiring Impervious Fill.

Excess materials such as earth, pipe, valves, etc., or material not suitable for re-use in the embankment shall become the property of the Contractor and shall be disposed of by him.

Article 82 Engineering Services The Contractor shall be furnished required lines and grades for the construction of the culvert and inlet works, the 16" drawdown pipe, and for the alterations to the existing spillway and bridge walls.

The slope lines for the embankment shall match the existing slopes, and the Engineer shall be the sole judge in determining the acceptability of the slopes.

The Contractor shall protect all of the Engineer's stakes and markings and he shall not remove any of them without prior approval of the Engineer. In case any of the Engineer's stakes or other markings are removed or disturbed during the progress of the work, such stakes or markings shall be replaced by the Engineer, and the Owner may deduct the cost of making such replacements from payments due the Contractor under the terms of the Contract.

ITEM 1

Construction of Intake & Discharge Conduit & Restoration of Dam

Article 83A Work Included Work included under this item is the furnishing of all labor, tools, material and equipment required to construct, ready to use, the intake structure, the discharge conduit, and the re-alignment of the existing 16" cast iron drawdown pipe and the furnishing and installation of a sluice-gate and appurtenances. It also includes all excavation required for constructing the above items and the restoration of the dam where such excavation is carried out, and the debris pins and sleeves in the wiers.

It does not include the access bridge and steps extending from the top of the embankment to the intake structure, which are included under other items.

It does not include riprap and excavation for riprap.

It does not include the repairs and alterations to the existing footbridge abutments and overflow spillway walls which are included under applicable items.

This item includes all work described in detail below in Articles 83B to 83-O and any other work required for or incidental to providing an intake structure, discharge conduit, and drawdown pipeline complete and ready to use.

Article 83B Preparation of Site The Contractor shall prepare the site for his operations by carrying out the following items:

1. Erect protective fences and signs at least 50' east and west of the limits of the work, as required in Article 80, Paragraph 3.

2. Remove the chain link fence at the top of the dam embankment for a distance of approximately 50' each side of the centerline of construction.

3. Remove and dispose of an 18" maple tree located approximately 8' left of station 0+93.

4. Clean out the intake chamber at the upper end of the existing 16" drawdown line.

Article 83C Excavation Included under this item is all excavation required for the construction of the intake structure, the discharge conduit and for the re-alignment and reconstruction of the existing 16" drawdown pipe.

Excavation shall be divided into two classes--namely,

1. open excavation from the top of the existing embankment to elevation 114.0, and

2. trench excavation within sheathing from elevation 114.0 to the

bottom of the various structures. Special care shall be used in excavating for the seep rings and for the cut-off at station 0+95, both of which are to be poured against undisturbed earth.

Materials to be reused in the construction shall be stored in the pond area in accordance with the requirements of Article 83K, paragraphs 3 and 4.

Surplus materials or materials unsatisfactory for re-use in the structure shall become the property of the contractor and shall be disposed of by him in a manner satisfactory to the Engineer.

This item also includes the necessary excavation for re-aligning and reconstructing the existing 16" drawdown pipeline.

The open cut shall be carried out in such a manner that all slopes shall be not sharper than 1½ horizontal to 1 vertical.

This item does not include excavation required for placing riprap nor excavation required in repairing and altering the existing footbridge abutments and overflow spillway walls, which work is included in other items.

Article 83D Rock Excavation No appreciable amount of rock excavation is anticipated on this project. For that reason no item has been set up for such excavation. Removal and disposal of boulders is to be considered as excavation required under Item 1.

Article 83E Sheathing Included under Item 1 is the furnishing, installing and removal of sheathing from elevation 114.0 to grades sufficiently below the bottom of excavations to prevent boils or blow-up of the bottom of trenches.

Sheathing may be either tongue-and-groove wood sheathing or interlocking steel sheathing. It shall be the Contractor's responsibility to dewign and provide a system of sheathing and bracing that will adequately protect the work being done; however, his design shall in every case be subject to the approval of the Engineer. The Engineer's opinion concerning the safety and stability of the method of sheathing and bracing used or proposed shall be final and in every case binding on the Contractor.

1. Methods of Construction After excavation has been carried to elevation 114.0, the Contractor shall drive sheathing ahead of excavation. The Contractor shall drive the sheathing into the soil beyond the limits of excavation a distance sufficient to prevent boiling or upheaval in the trench bottom.

   Where it is necessary to carry braces thru the barrel of the discharge conduit or the walls of the intake structure, forms shall be boxed out so as to provide at least 3 inches clearance around the braces. After removing the sheathing, holes in the

walls shall be closed by bricking in with solid brick walls. Reinforcing steel shall not be cut thru such openings and bars which normally fall within the opening shall be enclosed in the brickwork.

Upon completion of the work, the sheathing and bracing system shall be carefully and completely removed so as to prevent any settlement of the material adjacent to the trench. The trench shall be backfilled and the material therein well compacted to the level of the bracing before the wales and braces are removed. Trenches shall be filled in progressive steps until the backfilling has reached the level of the uppermost set of wales and braces. When the backfill has reached this level, the sheathing may be pulled and the voids left in pulling the sheathing shall be filled in a manner satisfactory to the Engineer. In General, filling of these voids shall be accomplished by sluicing sand and gravel into the voids using a high pressure hose. The sheathing shall extend from station 0-2.5 to station 0+95 with an end closure at station 0-2.5.

Article 83F Discontinuance of Existing Conduit thru Dam Included under Item 1 is the breaking out and plugging of the existing masonry conduit thru the dam, including any or all excavation required to accomplish the complete discontinuance of this line.

1. Construction Methods Before discontinuing the existing conduit, the contractor shall provide a system for temporarily handling the flow of the brook as required below and in Article 80, Paragraph 4, above. After the temporary system has been installed, the contractor shall break out the top of the existing masonry culvert excepting at seep rings and at the cutoff where he shall break out the entire barrel of the conduit. He shall exercise special diligence and care to preserve the bottom section of the conduit. All brick, earth and other debris shall be completely removed from the sections of conduit left in place, and these sections shall then be filled with concrete meeting the requirements of Article 83G excepting that it shall be 2,000-lb 28-day strength.

   The existing overflow manhole shall also be completely removed to a level just below the bottom of the floor for the proposed discharge conduit, and after removing all bricks, earth and other debris from the manhole, it shall be filled with 2,000-lb concrete.

   Care shall be exercised to keep the top of the concrete fill in these structures below the grades for the proposed discharge conduit.

   After the concrete fill develops sufficient sgrength in the opinion of the Engineer, the subgrade shall be neatly graded to the proper elevations for the construction of the discharge

conduit. The subgrade shall be compacted as may be required by the Engineer.

Article 830 Concrete - Work Included All concrete work that is to be done under this contract shall meet these specifications.

1. General It is the intent of these specifications to secure, for every part of the work, concrete of homogeneous structure which when hardened, will have the required strength and resistance to weathering and disintegration. To this end, the requirements hereinafter specified must be met. Standard tests of the cement, aggregates, concrete and reinforcement will be conducted by the Engineer. The Contractor shall furnish the material for all required samples and labor as requested for obtaining samples. The Contractor agrees to accept as final the results of tests secured by testing laboratory engaged by Owner.

2. Concrete shall have a compressive strength at 28 days of at least 3,000 pounds per square inch, excepting that used for filling the existing culvert and manhole which shall have a compressive strength at 28 days of at least 2,000 pounds per square inch.

For 3,000# concrete: Min. Cement Content = 5.6 bags per cu. yd. of concrete

Maximum = 6.25 gals of water per bag of cement including water content in aggregate

Consistency Range in slump inches = 2-4

3. Portland Cement The Contractor shall furnish Portland Cement of the quality herein specified in sufficient quantity for the work required. All cement furnished for concrete in a given structure shall be of the same type and color so as to avoid variations in the color of the finished exposed concrete. Cement furnished shall be dry, free of lumps, and of a uniform blue-gray coloring. Cement shall meet the requirements of the A.S.T.M. specifications C150-53, Type 2 or Type 3. All cement shall be air-entraining.

4. Fine Aggregate The fine aggregate shall consist of sand composed of grains or particles of quartz or other hard and durable rocks, the surfaces of which are not coated with any foreign material nor worn smooth. The grains shall be moderately sharp, free from soft, decomposed or partly decomposed sand grains, free from soft, decomposed or partly decomposed sand grains, lumps of clay or ferruginous cemented sand, mica, loam, sea salts, organic matter or other foreign materials. If the fine aggregate is washed it shall be allowed to stand at least twenty-four (24) hours in piles after being washed before being used if so directed. The sand shall be well graded from coarse to fine and when tested by means of square mesh laboratory sieves shall meet the following requirements:

Passing 1/4" sieve - 100%
Passing #4 sieve - 95% to 100%
Passing #20 sieve - 30% to 75%
Passing #50 sieve - 5% to 28%
Passing #100 sieve - not more than 8%
By elutriation test- not more than 3%

5. Coarse Aggregate Coarse aggregate shall consist of crushed stone or screened gravel conforming to the following requirements: Crushed stone or screened gravel shall consist of clean, hard, durable and impermeable particles, resistant to wear and frost and free from injurious amounts of organic matter, loam, clay, slat salts, mica and structurally weak particles. The particles shall be relatively round in shape and with gritty surfaces. Gravel shall be washed until the surfaces are clean and free of dust and surface coatings. Crushed stone shall be washed if the surfaces are coated with dust.

6. Grading of Coarse Aggregate When tested by means of square mesh laboratory sieves, coarse aggregate shall meet the following requirements:

NOMINAL SIZE	PER CENT BY WEIGHT PASSING THROUGH			
	1-1/2	3/4	3/8	#4
1-1/2	95-100	30-60	5-20	0-5

7. Water Water for use with cement shall be clean, clear and free from deleterious amounts of oil, acid, alkali, salts and organic matter.

The water shall exhibit no deleterious effect upon the strength, setting or soundness of the cement.

8. Forms Approved forms shall be provided and used by the Contractor. The forms shall be in good condition, clean and properly treated to give the concrete a smooth even finish. They shall be constructed of T&G lumber, metal, plywood or composition facing and shall be sufficiently rigid so that they can be constructed and braced true to line and grade.

Forms shall be left in place until the concrete is sufficiently hardened and has attained a reasonable percentage of its final strength. Both before and after the form removal, proper attention must be paid to the moist curing of the concrete.

The Engineer will require that the Contractor use ties that can be broken off within the wall and the resulting hole plugged with a grout containing an admixture to prevent shrinkage.

9. Mixing All concrete used on this job is to be furnished by a transit-mix company from the metropolitan area, having a reasonable background in this business. The concrete is to be delivered to the job site in the transit-mix trucks in an unmixed condition. After arrival at the job site, the cement and aggregates

are to be dry-mixed for thirty seconds and wet-mixed for at least four minutes, before placing in the forms.

Concrete shall be mixed in such quantities and at such times that any truck load can be placed in the forms within thirty minutes after the addition of water. No retempered concrete is to be used. No water is to be added to the trucks after prolonged mixing in order to retard initial set. No concrete is to be used that arrives on the job site already mixed.

10. Placing Concrete The forms shall be properly cleaned and wetted prior to the placing of concrete. All imbedded items are to be properly protected. All reinforcing is to be in proper condition and in the correct location. If the pour is to be made against existing concrete, the surface of the existing concrete shall be prepared as described in Article 83G-11.

Concrete shall be placed in a manner to prevent stone pockets, voids or segregation. Concrete shall not be dropped, flowed or dragged more than seven feet in the forms. Concrete shall be properly distributed and re-mixed in the forms with shovels, rods and vibration.

The Contractor will be allowed to use mechanical vibrators of a type and number approved by the Engineer. The use of the mechanical vibrators shall not eliminate the rodding of the concrete at the face of the forms.

In addition to steel reinforcement there will be built into, or set or attached to the concrete, pipes, anchors or other metal objects as shown on the drawings or ordered. All necessary precautions shall be taken to prevent these objects from being displaced, broken or bent. Before placing concrete, care shall be taken to determine that any embedded parts are firmly and securely fastened in place as indicated. They shall be clean and free of paint, rust, oil or any other coating or foreign matter. Concrete shall be packed tightly around pipes and other metal work so as to prevent leakage and secure perfect adhesion. Pipes shall be adequately protected from intrusion of concrete into them.

11. Joints Only the construction joints called for on the plans will be allowed except on approval of the Engineer

All horizontal construction joints are to be treated as follows. After pouring of the concrete and after initial set of the concrete has taken place, the construction joint is to be cleaned off with a jet of water or a jet of air and water mixed. The jet shall have sufficient force to clean off all loose concrete, scum and latence. The jet shall expose and clean off aggregate but shall not undercut or loosen the aggregate.

Before pouring new concrete against concrete already in place and hardened, the surface shall again be cleaned with a water jet. The exposed aggregate shall then be mopped with a mortar composed of the same proportions of sand and cement as is in the concrete. The mortar shall be placed and mopped in place immediately prior to the placing of concrete and shall not have set up or hardened prior to the placing of concrete.

The Construction joint located between the discharge conduit and the intake structure shall be coated with coal tar mastic before pouring adjacent section.

12. Protection of Concrete and Curing The Contractor shall protect the concrete from damage by rain, sun, frost, or underground water during and after placing, until properly cured and hardened in a manner satisfactory to the Engineer. The concrete shall be kept fully saturated and protected against any drying action by an approved method of curing for not less than seven days. When temperatures are 40° or lower, or when it appears temperature will drop below 35° within 24 hours after pouring, calcium chlorida shall be added as directed by the Engineer. This shall not affect the requirement for heating.

13. Finishing Concrete work will be finished as follows:

(a) Floors will be steel trowelled

(b) Exposed side walls and ceiling of conduit and intake are to have all raised fins removed and rat holes filled and patches rubbed to a smooth and even finish.

(c) Top of roof of conduit is to be screeded and wood floated to an even surface without additional finishing.

(d) Exposed exterior walls, posts and beams shall be rubbed with carborundum stone to a smooth uniform finish. No cement shall be added to the surface while rubbing; the finish shall be obtained by wet rubbing of the green concrete only.

(e) All form ties are to be broken off within the concrete and the resulting holes plugged with non-shrink grout.

Immediately after the removal of the forms, the work shall be inspected and defective work corrected. If the surface of the concrete is bulged, uneven, shows excessive voids, or has other markings which cannot be repaired satisfactorily, the entire section shall be removed as directed by the Engineer and replaced with satisfactory work; all such removal and replacement work to be done at the expense of the Contractor. If the work is satisfactory, the minor repairs required are to be completed immediately and the required rubbing is to be done as soon as the concrete can be properly worked.

The Engineer shall be the sole judge of the satisfactory quality of the work completed. He shall determine as to whether the concrete is so poorly placed as to require removal or whether proper corrective work can result in a satisfactory job.

14. Inspection The Engineer reserves the right to inspect the forms, reinforcing, etc., prior to the placing of concrete. The Contractor will be required to place one side of the wall forms and the reinforcing steel and shall give the Engineer reasonable notice to allow for inspection of the various features. Upon completion of forming and immediately before placing of concrete, the Engineer shall again be given reasonable notice to allow for final inspection. The Engineer will then give written approval for the placing of concrete for that portion of the work.

Article 83H Reinforcing Steel Work Included All reinforcing steel used on this project shall meet these specifications:

1. Materials Reinforcing steel used on this job shall be rolled from new billets. It shall be intermediate grade structural steel. Reinforcing shall conform to ASTM Specification A-305.

2. Cutting and Bending. All bars shall be shop cut and bent and shall arrive on the job ready for use. All bars shall be clean and free of rust, oil, grease and other deleterious matter when delivered to the job and shall remain in that condition until incorporated in the completed structure. Bars shall be bent in accordance with bending schedule hereto attached.

The Contractor shall submit to the Engineer detailed plans and schedules of the reinforcing.

3. Placement Steel shall be placed in the exact positions and with the spacing shown on the drawings or ordered by the Engineer. It shall be so fastened in position as to prevent being displaced during the placing of concrete. A correct distance between parallel rods shall be not less than the diameter of these rods. Where splices in reinforcement in addition to those indicated are necessary, there shall be sufficient lap to transfer by bond the stress in the bar. Rods shall be lapped not less than 40 diameters. Lapped ends of rods shall be sufficiently separated or properly connected together in such a manner as to develop the full strength of the rod.

All reinforcement shall be firmly supported by the use of metal bars, spacers, seats or anchors. The use of wood blocks is prohibited. The use of wire ties to hold the steel in correct relationship to the forms should be kept to a minimum. All reinforcement shall be placed on the day prior to the placement of concrete and in no case will the Contractor be allowed to place concrete without the Engineer's approval of the placement of the reinforcing.

Article 83-I Remove and Re-lay 16" Cast Iron Drawdown Pipe Work Included The Contractor shall remove the 16" gate valve and extension stem located in the overflow manhole, and sufficient of the 16" Cast iron drawdown pipe to permit relaying the line to the alignment shown on the plans. The Contractor shall do all trench excavation and backfill and furnish all pipe, fittings, couplings and specials required to re-align and connect the drawdown line to the proposed intake structure. The existing pipe shall be removed from a point approximately 18 ft. south of station 0+00 to the existing overflow manhole, or to such a distance as required by the Engineer in order to obtain satisfactory alignment and connection.

1. Construction Method After completing excavation for the discharge conduit to elevation 114, the existing 16" cast iron drawdown line shall be exposed to at least 22 ft. south of station 0+00. The exact alignment and location of fittings will then be determined by the Engineer. The Contractor shall then install the new connection to the intake structure continuing the brook flow thru the existing line, until such time as provisions have been made for carrying the brook flow thru the proposed discharge conduit location. Flow thru the existing drawdown line shall not be discontinued until satisfactory arrangements have been provided for temporarily handling the brook flow.

The trench around the pipe and that from which the pipe is removed shall be carefully backfilled with selected hand-placed material. Material under, around and for 1 ft. over the pipe shall be hand tamped with railroad tamping irons and hand tampers. Material above that level shall be firmly compacted with penumatic or other approved mechanical tampers.

The contractor shall construct any dams necessary for the control of water and shall provide all pumping and bailing necessary to provide satisfactory conditions for installing the pipe.

2. Materials Fittings shall be 16" cast iron flanged fittings, Class D style, as indicated on Plan.

Pipe shall be A.W.W.A. Class D flanged cast iron pipe.

Couplings required shall be Dresser Style 53, cast iron couplings.

Article 83J Control of Water Work Included The Contractor shall provide a temporary means of handling the brook flow, ground water and storm run-offs during the construction period, and this work is expressly included as part of this item, payment for which shall be included in the unit price for Item No. 1.

1. Construction Methods The control of water shall be accomplished basically by the installation of a temporary conduit or sluiceway running thru the location for the new discharge conduit, and pumping and bailing as required.

The Contractor shall advise the Engineer, in writing, before starting work, relative to the system he proposes to use for controlling water and only a system meeting the approval of the Engineer shall be used.

The system used must be relatively watertight, and under no circumstances shall water be allowed to flow thru the work in such quantities or in a manner which will disturb or soften material upon which structures are to be constructed.

Reference is made to Article 80, Paragraph 4.

All concrete shall be poured "in the dry", and the contractor shall do all work required to obtain and maintain satisfactory conditions at all times.

Article 83K Restoration of Dam Work Included Included under Item 1 is the restoration of the dam where it is breached during construction. Item 1 includes furnishing, placing, compacting, shaping and grading of the various classes of fill, fine sand, broken stone, bank run gravel and loam required to restore the dam as required and shown in detail on the plans.

1. Materials

(a) Fill. There are four different zones in the dam, each requiring a different material. The central portion of the dam designated "Impervious Core" shall consist of the most impervious material available, and shall be borrow furnished from outside the site by the contractor. The downstream section of the dam shall consist of selected material excavated from the existing dam and shall consist of granular pervious material unless borrow is ordered by the Engineer in accordance with Article 83K-3. The upstream section of the dam shall consist of semi-pervious material, taken from material excavated from the dxisting dam. The upstream face of the dam shall be covered with clean, sharp sand or fine washed gravel (commonly called grits).

2. Impervious fill Under Item I, the Contractor shall furnish sufficient acceptable impervious fill from outside the project site for the construction of the impervious core in the location and to the cross-section shown on the Plan. Payment for all impervious borrow furnished shall be included in the lump sum price for Item #1. This material shall consist of selected, impervious soils consisting of a mixture of sand, gravel and clay containing not less than 30% nor more than 60% of material passing a No. 200 mesh sieve. The material shall be of a semi-cohesive nature.

3. Pervious Fill Pervious fill shall consist of the more granular material removed from the present dam embankment. Whil excavation of the dam is being done, material suitable for pervious fill shall be separated from other materials and stored separately.

In the event that material removed is not satisfactory in the opinion of the Engineer for pervious fill, the Contractor when so ordered by the Engineer in writing shall furnish borrow for the downstream portion of the dam. Material furnished for this purpose shall be a granular, non-cohesive, free-draining material comprised mostly of sharp sand and gravel. It shall be essentially free of clay.

Refer to Article 83R below for method of payment when previous borrow is furnished by the Contractor.

4. Semi-Pervious Fill shall consist of selected material excavated from the existing dam embankment, stored in the pond area, and replaced in the upstream section of the dam. All stones larger than 6" in their largest dimensions, concrete or brick-bats shall be removed from material to be placed in the dam.

5. Sand Blanket on Upstream Face The contractor shall furnish and place the two-ft. thick layer of sand on the upstream face of the dam as shown on the plans. This material shall consist of clean sharp sand or fine gravel. Generally speaking, a suitable material can be found "bank-run" in most gravel pits, provided material is selected that is practically free of stones. The material shall be practically free of organic matter, roots, sod, wood or other deleterious materials.

6. Broken Stone Fill In order to control wave action and prevent erosion of the newly placed fill on the upstream face of the dam, the Contractor shall place an eight inch (8") thick layer of 2" crushed stone or washed gravel between elevation 124.3 and 132.0 on the upstream face of the dam. This stone shall replace an equal volume of sand from the sand blanket required under Article 83K-5.

7. Prior Approval Required for Borrow No borrow materials shall be incorporated in the dam embankment until the Engineer has approved the source of material. The Contractor shall advise the Engineer on the source of borrow he proposes to use and shall furnish the Engineer upon request with representative samples.

8. Weather conditions Weather conditions will control the placement of embankment material to a great extent.

No frozen material is to be incorporated in the embankment.

All material incorporated in the embankment is to be at its optimum moisture level and material not meeting this requirement shall not be used. Any material already in place that becomes soft, muddy or saturated due to rain or flooding shall be removed from the embankment.

9. Construction Methods The surface of material remaining in the dam embankment shall be prepared to provide proper

bond between the old material and new fill, by loosening the surfaces either by power scarifying or by hand picking. Surfaces shall be loosened to a depth of at least four inches (4") before placing new fill on them.

Material in the main portion of the dam is to be placed so that the top of the dam along its longitudinal axis is maintained practically level. Placement of impervious fill under Par. 2 shall be kept slightly ahead of the other material so that the top of the dam shall always have a small, free-draining hump in it.

Material shall be placed in layers of not more than 8 inches measured loose and each and every area shall be compacted by at least two passes of the treads of a heavy (D-8 or equal) dozer. Trucks shall be diverted over the newly placed fill as much as possible but care is to be taken to see that they never follow each other in one set of tracks.

Material shall be placed at the most advantageous moisture level. Material too dry shall be sprinkled as required. Material too wet shall be allowed to dry before being compacted in the fill. In general, only the impervious central core of the dam will need any special moisture control. This material, when being compacted, shall contain sufficient moisture to allow it to be formed into a hard ball or to be molded with firm pressure of the fingers. It shall not contain so much moisture that the compaction process described above will result in excess water being brought to the surface of the soil.

In any areas that cannot be reached and compacted by the dozer, compaction is to be effected using a Barco tamper. All material placed in 8-inch layers is to receive at least one pass with this tamper. If pneumatic tampers are used, material is to be placed in layers not to exceed 4 inches thickness measured loose.

After a period of rain or high humidity, all muddy or loose material is to be pushed off the dam and disposed of in the downstream bed of the reservoir.

At all times care must be taken to secure good bond between successive vertical layers of material placed and between the various horizontal layers.

Upon completion of the main structure of the dam itself and trimming of the side slopes, the Contractor may proceed with placing the sand mat, broken stone wave-control blanket and loam borrow.

Article 83L Debris Pins & Sleeves The Contractor shall furnish and install brass pipe sockets and steel debris pins as shown on the plans on each wier.

The pipe sockets shall be accurately set and cast into the concrete.

1. Materials Pipe sockets shall be 1¼" standard red brass pipe. The bottom of each sleeve shall be closed with a brass cap, and during construction, the top of each socket shall be closed with a brass coupling and brass plug.

Pins shall be 1 1/8" diameter hot rolled steel "Rycase", identifying color Gold. Other steel having a yield point of 44,000 psi may be substituted.

Article 83 M. Loam & Seed Work Included Included under Item I is the furnishing, placing, spreading, and fine grading of loam borrow on both faces of that portion of the dam distrubed, and the liming, fertilizing and seeding of all areas loamed. Loam is to be placed in the areas indicated on the plans.

1. Materials Loam borrow shall be of a quality acceptable to the Engineer and shall be a good grade, black natural soil containing a reasonable amount of humus.

Limestone shall be agricultural ground limestone.

Fertilizer shall be a standard commercial 5-10-5 fertilizer.

Seed shall meet the following analysis:

Orchard Grass - 30% or less
Domestic Rye - 20% or less
Red or Cured Fescue - 20% or more
Blue Grass - 20% or more
Other perennial grasses - 8%
Inert material, weeds and other matter - 2% or less

2. Construction Methods After all other work has been completed and the area generally cleaned up, the top surface of slopes where loam is to be placed shall be fine graded to a plane six inches (6") below the proposed finished surface. Loam shall then be spread over the areas to provide six inches (6") of loam when compacted. The loam shall be fine-graded to proper lines and so as to match and blend in with the grassed areas of the old embankment. Ground limestone shall then be spread over the loam at the rate of one pound (1 lb.) per square yard, and fertilizer spread at the rate of 0.2 pound per square yard. After this the loam shall be spaded to its full depth. It shall then be regraded and rolled to a smooth even surface. The surface shall be loosened by raking and seed sown at the rate of 5 lbs. per 100 sq. yds. Seeding shall be done in two directions at right angles to each other. Seed shall then be covered with a thin layer of loam and the entire area rolled to a firm smooth surface. Loamed & seeded areas shall be kept moist for at least 14 days after sowing.

The Contractor may top mulch or otherwise protect the newly seeded areas as required.

The Contractor shall maintain seeded areas until all work is

complete and accepted. Maintenance shall consist of providing protection against traffic and erosion and watering as necessary. Damaged areas and areas of unsatisfactory growth shall be repaired and reseeded as necessary at no additional cost to the Owner.

Article 83N Re-set Chain Link Fence and Furnish New Gate Work Included Included under Item I is the re-setting of the chain link fence now standing on the southerly edge of the top of the dam embankment, and the cutting and re-aligning of the fence to provide for the installation of a new three-ft. (3') gate with locking device.

1. Materials The existing fence shall be salvaged and all materials re-used to restore the fence. If posts or other parts are damaged or lost, new posts and/or other parts of the same size and pattern as those damaged or lost shall be furnished by the Contractor at no additional cost to the Owner.

   The Contractor shall furnish one (1) new chain link fence gate three feet (3') wide full height of fence, with $2\frac{1}{2}$" O.D. gate posts. Wire mesh shall match mesh of present fence. Gate shall be equipped with spring latch with provision for attaching a padlock to the latch.

   The Contractor shall also furnish any new or additional fittings or specials required for or incidental to restoring the fence and inserting the gate.

2. Construction Methods The existing fence shall be carefully removed and stored as required under Article 83B, Paragraph 2.

   After all other work has been completed, the fence shall be re-erected. Posts shall be set 30" deep in concrete. The concrete shall be properly shaped at its top to shed water away from posts.

   The fence shall be re-set to the same line and grade it now has.

   Posts shall be securely braced until concrete has set to insure their holding proper position.

Article 83-O Sluice Gate Work Included Included under Item I is the furnishing and installing of a 16" sluice gate, Chapman Valve Mfg. Co. Table 5, or approved equal, flange type frame with steel extension stem, two (2) stem guide brackets and bearings cast iron stand support and plain gate stand, and anchor bolts or other appurtenances required to complete the installation. The Contractor shall also furnish and install in the south wall of the intake structure a 16" flanged wall casting or thimble to which the sluice gate shall be attached on the inside of the intake and the 16" drawdown pipe attached outside the intake.

Gate stand shall be mounted at the top of the intake structure and provisions shall be made in the aluminum grate required below for the cast iron stand support.

Anchor bolts for the cast iron stand shall be cast into the concrete.

Article 83P Aluminum Grates Work Included Included under Item I is the furnishing and installing of aluminum grates at the top of the intake structure, including bearing angles, anchors, and fastening blocks all as indicated and shown on the plans.

1. Materials Grating shall be aluminum Thelen Type A-1, 1" depth; bearing angles shall be aluminum Thelen Type A-1 with aluminum anchors @ 12" centers; fastener blocks shall be aluminum Thelen Type F-1. (Grating of another manufacturer of approved equal may be substituted for Thelen).

2. Construction Method The bearing angles shall be cast into the concrete as shown on the plans. Angles shall be fastened to the forms with aluminum nails on all four sides of openings in top of intake. Fastening blocks shall be secured to bearing angles on bearing sides only with 3/8" aluminum allen set screws. Bearing angles shall be drilled and tapped after setting.

One (1) grating shall be cut to provide for the cast iron gate stand to be mounted at the top of the intake structure.

Article 83Q Steel Bar Rack for Orifice Opening Work Included Included under Item I is the furnishing and installing of a steel bar rack in the orifice opening on the south side of the spillway shaft.

1. Materials Structural steel shall be standard hot-rolled structural shapes; size, style and fabrication as shown on plans.

Anchor bolts shall be L-shaped $\frac{1}{2}$" diameter cast in concrete in proper locations for anchoring the angle frame.

2. Construction Methods The bar rack shall be constructed by welding together four 3/16 x $2\frac{1}{2}$ angles to form a 4-sided frame. $\frac{1}{4}$"x$2\frac{1}{2}$" flat steel shall be welded top and bottom to the frame. Spacing on the bars shall be approximately $5\frac{1}{4}$" on centers.

3. Painting All structural steel and exposed anchor bolts and nuts shall be painted 3 coats in accordance with the requirements of Article 84C.

Article 83R Gravel Walk Work Included Included under Item I is the construction of a gravel walk across that section of the existing dam embankment disturbed during construction. Also included is the stone-dust covering of this walk.

1. Materials Gravel shall be an acceptable bank-run gravel from which all stones with largest dimension greater than 4" have been removed.

Stone dust shall be trap-rock stone dust.

2. Construction Method The top eight inches (8") of the dam embankment shall consist of gravel installed and compacted in

two (2) four-inch (4") layers. The top surface shall be crowned each way from the centerline and shall have a uniform grade. After all other work is completed, the gravel shall be covered with 1/2" stone dust, which shall be rolled to a smooth finish. The stone dust shall be dampened to assist compaction.

Article 83S Payment Payment shall be made to the Contractor for all labor, tools, materials and equipment furnished in constructing the intake structure, discharge conduit, and draw-down pipeline complete and ready to use, at the lump sum price specified in his proposal, which payment shall include: preparation of site, excavation, sheathing, concrete reinforcing steel, sluice gate, cast iron pipe, fittings, debris pins and sockets, aluminum grating and appurtenances, removal and resetting of fence, furnishing and erecting new gate, and restoration of dam embankment, and any or all work required for or incidental to providing a complete facility ready to operate.

If the Contractor is ordered in writing by the Engineer to furnish borrow for Pervious Fill in accordance with Article 83, Par3, additional payment over and above the lump sum payment for Item No. 1 shall be made to the Contractor as follows: for each cubic yard of Pervious Borrow furnished, hauled, placed and compacted, the sum of one dollar and twenty-five cents ($1.25) which payment shall include all labor, materials, tools and equipment required for or incidental to furnishing, placing, and compacting pervious fill when such fill is ordered in writing by the Engineer.

Quantity upon which payment shall be made for Pervious Fill Borrow shall be determined either by measurements made in the field by the Engineer or on a truck measurement basis at the option of the Engineer. If truck measurement is used, the Contractor shall furnish to the Engineer, a delivery slip for each load of borrow furnished. Truck measure shall be based on the actual cubage of the truck body with an allowance for heaping.

ITEM 2

Access Bridge

Article 84A Work Included Included under Item 2 is the furnishing of all labor, tools, materials, and equipment required for or incidental to providing an access footbridge between the top of the dam embankment and the intake structure, including structural steel, anchor bolts and other fastenings, and lumber, all as shown in detail on the Plans and further described herein.

Article 84B Materials The materials furnished under this item shall be as follows:

(a) Structural Steel shall be standard hot rolled structural, shapes, size, style and fabrication as shown on Plans. Bearing plates shall be as shown on Plans.

(b) Anchor Bolts shall be "L" shaped, 5/8" diameter anchor bolts cast in concrete in proper locations for anchoring structural steel.

(c) Lumber shall be No. 1 85% heart long-leaf yellow pine, sizes as shown on Plan.

(d) Preservative All wood shall be given 2 coats of hot coal-tar creosote oil before it is fastened in position. All cuts and bore holes shall also have two coats of preservative.

Article 84C Painting All structural steel and exposed anchor bolts and nuts shall be painted three (3) coats. The first coat shall consist of a shop coat of red lead primer. The steel shall not be handled, or trucked, or otherwise moved until at least seven (7) days after the shop coat has been applied.

After erection, all damaged areas of the prime coat shall be thoroughly cleaned and touched-up with red lead primer.

After the touch-up coat has thoroughly dried, the second coat of gray primer shall be applied. This shall be allowed to dry at least seven (7) days before applying the finish coat.

The finish coat shall be structural Chrome Oxide Green Paint.

Article 84D Payment The Contractor shall be paid at the lump sum price specified in his proposal for all labor, tools, materials and equipment furnished in providing an access footbridge, which payment shall include the furnishing and installing of all structural steel, lumber, bearing plates, anchor bolts and other fastenings required for or incidental to providing a complete structure excepting concrete supports at ends which are to be paid for under other items.

ITEM 3.

PREPARATION OF BRIDGE AND SPILLWAY WALLS

FOR

ALTERATIONS AND RESTORATION OF BRIDGE

Article 85A. Work Included. Included under this item is the furnishing of all labor, tools, materials and equipment required to remove the wooden portion of the foot bridge and sections of the steel rail beams at each end to provide space for carrying out the work of altering the walls surrounding the bridge, and the restoration of the bridge structure after the completion of the alterations to the walls. The work includes but is not limited to removing and disposing of the bridge floor planking, the $3\frac{1}{2}$"x$5\frac{1}{2}$" nailers, the wooden curb guards and the wooden fences and cutting off each of the railroad rails which serve as bridge beams at each end, as shown on the plans and removing and resetting chain link fence. It includes also drilling in the top of the existing walls to provide for dowels between the existing concrete and the proposed concrete. It also includes the restoration of the foot bridge with new materials as required below, after the completion of the alterations to the concrete walls. It does not include trench excavation which is included under Item 4.

Article 85B. Materials. Lumber shall be #1, 85% heart, long-leaf yellow pine, sizes same as existing members. The lumber shall be treated with two coats of coal tar creosote oil applied after the lumber has been cut and before it is installed.

Material for guard rail to be installed on north side of bridge only shall be peeled Cedar logs for both posts, rails and braces, sizes similar to existing members.

Article 85C. Methods. The Contractor shall remove the guard rail and the curb guard, bridge planking and nailers. The ends of the existing bridge beams (railroad rails) shall be cut off so as to provide 12" bearing on the existing concrete walls. $1\frac{1}{2}$" holes, 18" deep shall be drilled along the top of the existing walls where they are to be raised at 18" centers.

After completion of the alterations to the walls surrounding the bridge, the bridge shall be restored by installing new guard rail, on the north side only, curb guards, bridge

planks and nailers as required above. All fastenings shall be similar to existing fastenings.

All steel shall be scraped and thoroughly cleaned and painted with three (3) coats of paint in accordance with the applicable portions of Article 84C.

Article 85D Payment The Contractor shall be paid for work performed under this item at the lump sum price specified in his proposal, which payment shall include the furnishing of all labor, tools, material and equipment required for or incidental to preparing the bridge for the alterations to the walls surrounding it, the removal and disposal of wooden portions of the bridge and in the restoration of the bridge. It shall not include payment for altering the existing concrete walls, nor for trench excavation required, both of which shall be paid for under their respective items.

ITEM 4.

TRENCH EXCAVATION

Article 86A. Work Included. Work included under this item is the furnishing of all labor, tools, material and equipment required for excavating around the existing bridge and spillway walls and in excavating on the downstream side of the discharge conduit and existing spillway for placing riprap. It also includes backfill of the areas excavated when such filling is required. It does not include any of the excavation required for installing the intake structure, the discharge conduit and the drawdown pipeline, all of which are included under Item 1.

Article 86B. Construction Methods. Excavation shall be carried out in the locations and within the limits designated by the Engineer. Excavation required for altering the concrete walls around the foot bridge shall be done by hand methods. Excavation for riprap may be done either by hand or by machine methods.

Backfill of trenches shall be done by hand, and all material shall be tamped using pneumatic or other approved mechanical tampers in layers not exceeding 6-inches. No stones whose largest dimensionexceeds 6" shall be used in backfilling. The top 8" of trenches in the walkway shall be filled with bank-run gravel and covered with trap rock dust in the same manner as required under Item 1 Article 83Q..

Article 86C. Payment. The Contractor shall be paid for each cubic yard of trench excavation carried out at the direction of the Engineer at the unit price specified in his proposal for trench excavation, which payment shall include furnishing of all labor, tools, materials and equipment required for or incidental to providing trenches for carrying out the work or placing materials as may be required. It shall also include all backfill of the trenches as required.

ITEM 6.

MISCELLANEOUS CONCRETE

Article 87A. Work Included. Included under this item is the furnishing of all labor, tools, materials and equipment required for providing concrete extensions to the existing walls surrounding the foot bridge and spillway. It includes the furnishing of all form work required and the preparation of existing concrete surfaces except the drilling of dowel holes which is included under Item 4.

Article 87B. Materials. Concrete furnished under this item shall comply with the requirements of Article 83C.

Article 87C. Construction Methods. Concrete extensions to existing walls surrounding the foot bridge and spillway shall be constructed to the lines and grades required by the Engineer. Details shown on the Plans are approximate only and the exact requirement for the extensions required under this item will be determined in the field at the time of construction.

Article 87D. Finishing. All exposed surfaces shall be finished by rubbing to a smooth even surface with carborundum stone. The addition of cement or grout to the concrete surfaces for the purposes of finishing will not be permitted. Work under this item shall comply with the requirements of Article 83G, Para. 13.

Article 87E. Payment. The Contractor shall be paid for each cubic yard of concrete formed, placed and finished for altering the existing walls around the foot bridge and the spillway walls when directed by the Engineer at the unit price specified in his proposal, which payment shall include all work required for or incidental to providing and completing alterations to the existing walls as shown on the plans or as required by the Engineer.

ITEM 6

REINFORCING STEEL

Article 88A. Work Included. Included under this item is the furnishing and placing of re-inforcing steel as required in the proposed concrete extensions to the existing walls surrounding the foot bridge and spillway. It shall not include any reinforcing steel furnished and placed in the intake structure and the discharge conduit which steel is included and will be paid for under Item 1.

Article 88B. Materials Materials furnished under this item shall comply with the applicable portions of Article 83H.

Article 88C. Construction Methods. Reinforcing steel under this item shall be placed and supported in accordance with the requirements of Article 83H.

Article 88D. Measurement. Quantities upon which payment for reinforcing steel will be based, under this Item, shall be the actual length of the various size rods used as shown on the plans or as required by the Engineer multiplied by the standard unit weight for the particular size bar specified.

Article 88E. Payment. The Contractor shall be paid for each pound of reinforcing steel furnished and placed in the concrete extensions of the existing walls surrounding the foot bridge and spillway at the unit price specified in his proposal, which payment shall include the furnishing of all labor, tools, materials and equipment required for or incidental to the reinforcing steel work.

ITEM 7.

RIPRAP.

Article 89A. Work Included. Included under this item is the furnishing and placing of riprap in the brook channel downstream from the northerly end of the discharge conduit around the existing spillway. The item includes furnishing, hauling, placing, shaping and chinking riprap as required below. It does not include excavation for riprap which shall be paid for under Item 4.

Article 89B. Materials. Stone for riprap shall be sound, of approved quality and angular in shape. Rounded stones or boulders or relatively thin slabs will not be acceptable. At least 75% of the volume shall consist of stones that individually weigh at least 1,500 lbs. The remainder of the stones shall be so graded that when placed with the larger stones, the entire mass will be compact.

Article 89C. Construction Methods. The bed or subgrade upon which riprap is to be placed shall be carefully graded to the lines and grades required by the Engineer. The depth of riprap shall ve 24". No riprap shall be placed until the subgrade has been properly excavated and graded.

All stones shall be carefully placed on the prepared bed. Larger stones shall be placed as closely together as possible throughout the surface and spaces between these stones shall be filled with the smaller stones in such a manner that the entire surface will become a compact mass of stone. It will not be required that the surface shall be especially smooth or even. It will be required, however, that the average thickness of the stone work shall be as required on the plans.

Article 89D. Measurement. The quantity upon which payment shall be based shall be determined by measurements taken in the field by the Engineer. The measurements shall be taken in planes parallel with the surface of the riprap. No quantity will be included for riprap placed in areas not required by the Engineer. Maximum depth for which payment will be made shall be 24".

Article 89E. Payment. The contractor will be paid for each cubic yard of riprap furnished and placed as directed by the Engineer at the unit price stipulated in his proposal, which payment shall include the furnishing, hauling, placing and chinking of riprap or any other work required for or incidental to providing a riprap surface satisfactory for the discharge of the conduit.

ITEM 8.

FILLING, GRADING, LOAMING & SEEDING.

Article 90A. Work Included. Included under this item is the furnishing of all labor, tools, material and equipment required to fill the areas on the embankment slopes abutting the concrete walls at the existing spillway when their height is altered with earthen material, grading and loaming and seeding these areas. It shall include furnishing and placing all fill whether obtained as spoils from the work or borrowed from outside the site, as well as loam, seed, lime and fertilizer required.

Article 90B. Materials. Fill shall be ordinary earth with stones exceeding 6" in their longest dimension removed. It may be either spoils from other work, if satisfactory to the Engineer or ordinary borrow.

Loam, seed, lime and fertilizer shall comply with the requirements of Article 83M, Para. 1.

Article 90C. Methods of Construction. After the spillway and bridge walls have cured sufficiently, in the opinion of the Engineer, the areas surrounding them shall be filled to lines and grades and within the areas designated by the Engineer. The fill shall be fine graded approximately six (6) inches below the finished grades to provide for loam.

The fill shall be placed in six(6) inch layers and each layer shall be thoroughly compacted with pneumatic or approved mechanical tampers.

After the fill has been graded and compacted, loam shall be spread over the entire area six (6)inches deep. The grading, rolling, fertilizing and seeding of the loam shall be carried out in accordance with the requirements of Article 83M, Par.2.

Article 90D. Measurement. Quantity upon which payment shall be based shall be determined from field measurements taken by the Engineer. Measurements shall be taken in planes parallel to the finish surfaces. Measurement shall include only the areas in which filling, loaming and seeding have been required by the Engineer. The areas at the top of the embankment shall not be included under this item. They shall be filled with material removed from trenches and this work shall be included under trench excavation.

Article 90E. Payment. The contractor shall be paid for work performed under this item at the unit price specified in his proposal for each square yard of filling, loaming, seeding, liming and fertilizing in the areas abutting the existing spillway walls, which payment shall include furnishing all labor, tools, materials and equipment required for or incidental to the work.

FINAL CLEANUP.

Article 91. At the conclusion of all work the contractor shall remove the temporary fences and signs required under Article 80 above. He shall remove and dispose of all surplus materials resulting from his operations including earth, trees, stumps, roots or other debris in a manner satisfactory to the Engineer. The entire area over which he has worked shall be carefully raked and cleaned so as to leave the entire area in a manner satisfactory to the Engineer.

Dam Repairs

MINIMUM WAGE RATES and HEALTH and WELFARE FUND CONTRIBUTIONS as determined by the Commissioner under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27D, inclusive.

PROJECT: Local - Public Works TOWN: Chicopee - Bemis Pond Dam

Classifications	Current Hourly Rate	Contrib. H & W Fund	Total Hourly Rate	Changes: Hourly Rate	H & W Fund	Total Rate
				AFTER:		
Crane Operator	$3.25	3%	$3.35			
Compressor Operator 220 cu.ft.	2.25	3%	2.32			
Carpenter	3.05	.10	3.15			
Common Laborer	2.05	.07	2.12			
Iron Worker	3.68					
Cement Finisher	3.52½	3%	3.63½			
Bulldozer Operator	2.80	3%	2.88			
Truck Driver	2.39½					

Sec.26. Payments by employers to health and welfare plans under collective bargaining agreements or understandings between organized labor and employers shall be included for the purpose of establishing minimum wage rates as herein provided.

Sec.27. The aforesaid rates of wages in the schedule of wage rates shall include payments by employers to health and welfare plans as provided in the previous section, and such payments shall be considered as payments to persons under this section performing work as herein provided. Any employer engaged in the construction of such works who does not make payments to a health and welfare plan, where such payments are included in said rates of wages, shall pay the amount of said payments directly to each employee engaged in said construction.

Chapter 149, G.L.

CONTRACT



TIGHE & BOND

CONSULTING ENGINEERS

HOLYOKE, MASS.

C O N T R A C T

Clause 1. This Agreement, made this _____ day of _____ in the year nineteen hundred and fifty , between the _____ herein referred to as the "Owner", and _____ herein referred to as the "Contractor".

Clause 2. Witnesseth, That the parties to this Agreement, each in consideration of the agreements on the part of the other herein contained, do hereby agree, the Owner, for itself, and said Contractor for himself/themselves and his/their heirs, executors, administrators and assigns, as follows:

The Contractor agrees to furnish all equipment, machinery, tools and labor, to furnish and deliver all materials required to be furnished and delivered in and about the improvement and to do and perform all work in: _____ in strict conformity with the provisions herein contained and the Advertisement for Bidders and Proposal hereto annexed, and the General Requirements and Special Provisions hereto annexed, and with the plans referred to therein. All said plans, general requirements, special provisions, addenda,

Advertisement for Bidders, and Proposal are hereby specifically made a part of this contract as fully and to the same effect as if the same had been set forth at length herein.

Clause 3. In consideration of the foregoing premises the Owner agrees to pay and the Contractor agrees to receive as full compensation for everything furnished and done by the Contractor under this contract; including all work required but not shown on the plans for the items herein mentioned, and for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any delay or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all risks of every description connected with the work, and for all expenses incurred by or in consequence of the suspension or discontinuance of the work as herein specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, such price or prices as are set out in the accompanying proposal, and for

all work required, for which there is no item in the proposal, such compensation as is provided for in the aforesaid specifications.

IN WITNESS WHEREOF, the Owner has caused this instrument to be signed and its corporate seal to be hereto affixed in its behalf, and the Contractor has caused this instrument to be signed in its behalf.

For the Owner,

Witness:

By the

For the Contractor,

Witness:

By the

Chicopee - Cooley Brook Watershed - 1914



1914 Reports

"Plans of Cooley Brook Watershed - Chicopee, Mass. - 1914". 'Locations & Descriptions of Lands Taken for Chicopee Water Department in the City of Chicopee & Town of Ludlow.' Filed and recorded in the Hampden County Registry of Deeds August 12, 1914 (document #11986) as required by Section 2 Chapter 499 of the Acts of Legislature of Massachusetts for the year 1908.

City/Town	Ludlow
City/Town	Chicopee
Name	Despres, Angeline
Name	Peret
Name	Abbey, C C
Name	Atkins, Seymore D
Name	Lawton
Name	Bell, Hiram W
Name	Granfield & Loomis
Name	Kane, Patrick
Name	Dostal Brothers
Name	Cadwell & Coles
Name	Burnett, Henry A
Name	Burnett, Goodman A
Name	Britton, Royal
Name	Hammond
Name	Hamilton, Mary J
Name	Locke, Mary A

Name	Augustunowic, Wasil
Name	Rumrill, J Melville
Name	Lobodyez, Michael
Name	Loomis & Granfield
Name	Mason, Rollin S
Name	Miller, Edward P
Name	Munsing, Henry A
Name	Murphy, James
Name	Paine, William
Name	Parsons, F E
Name	Rudiger, Jules
Name	Simonds, J Leroy
Name	Tilley, Otis E
Name	Szczepanski, Joseph
Name	Lerne, Joseph
Name	Cowles & Cadwell
Name	Stider, George P
Streets	Burnett Street
Streets	Prospect Street
Streets	Field Road
Streets	Pendleton Avenue
Streets	Old Wood Road

Streets	Johnny Cake Hollow Road
Water	Morton Brook Reservoir
Water	Cooley Brook Reservoir
Water	Morton Brook
Water	Cooley Brook

PLANS

OF

COOLEY BROOK WATERSHED

CHICOPEE, MASS.

1914

Abbey	C. C.	Page 14
Atkins	Seymour D. Estate	" 23
Augustunowic	Wasil	" 21
Bell	Hiram W.	" 16
Britton	Royal Heirs	" 8
Burnett	Goodman A.	" 15
"	Henry	" 5-17
Cadwell & Cowles		" 27
Despres	Angeline	" 36
Dostal Bros		" 35
Granfield & Loomis		" 18
Hamilton	Mary J.	" 1-13
Hammond		" 6
Kane	Patrick	" 32
Lawton		" 22
Lerne	Joseph	" 12
Locke	Mary A.	" 24
Lobodyez	Michael	" 30
Loomis & Granfield		" 18
Mason	Rollin S.	" 34
Miller	Ed. P.	" 37
Munsing	Henry A.	" 19-31
Murphy	James	" 2
Paine	William	" 3
Parsons	F. E.	" 10
Peret		" 20
Rudiger	Jules	" 29
Rumrill	J. Melville	" 9
Simonds	J. Leroy	" 38
Stider	George F.	" 7
Szczepanski	Joseph	" 4
Tilley	Otis E.	" 33
Unknown		" 11-25-26-28

see plan on last page showing whole taking

LOCATIONS AND DESCRIPTIONS
OF
LANDS TAKEN
FOR
CHICOPEE WATER DEPARTMENT
IN THE
CITY OF CHICOPEE AND TOWN OF LUDLOW

The purpose for which these lands are taken is to protect and preserve the purity of the water supply of the City of Chicopee, Massachusetts.

CITY OF CHICOPEE
BOARD
OF
WATER COMMISSIONERS

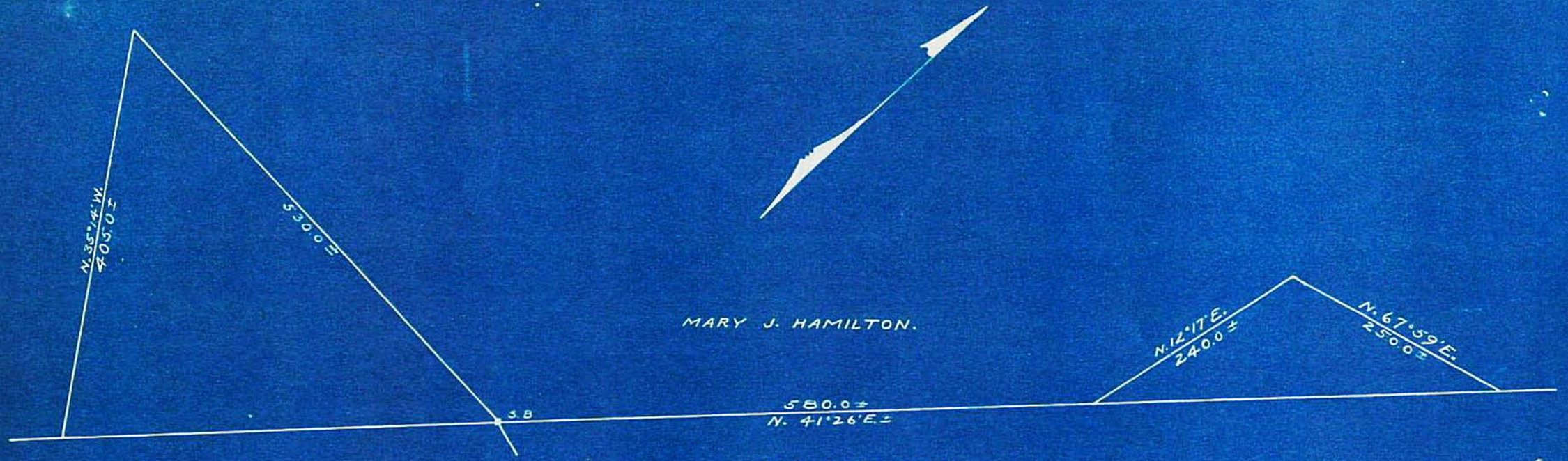
George H. Fuqere Chairman.
Francis Hudson
James J. Taylor

Filed and recorded in the Hampden Registry of Deeds August [redacted] 1914 as required by Section 2 Chapter 499 of the Acts of Legislature of Massachusetts for the year 1908.

11986

Hampden Co. Registry of Deeds
RECEIVED and RECORDED
AUG 13 1914
at 3 o'c 10 M P M

THOMAS A. McDONALD
City Solicitor
HARRY R. ELDER
Special Counsel
COBB, BEESLEY AND MILES
Engineers



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
MARY J. HAMILTON.

SCALE:- 1 IN. = 100 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Parcel #1

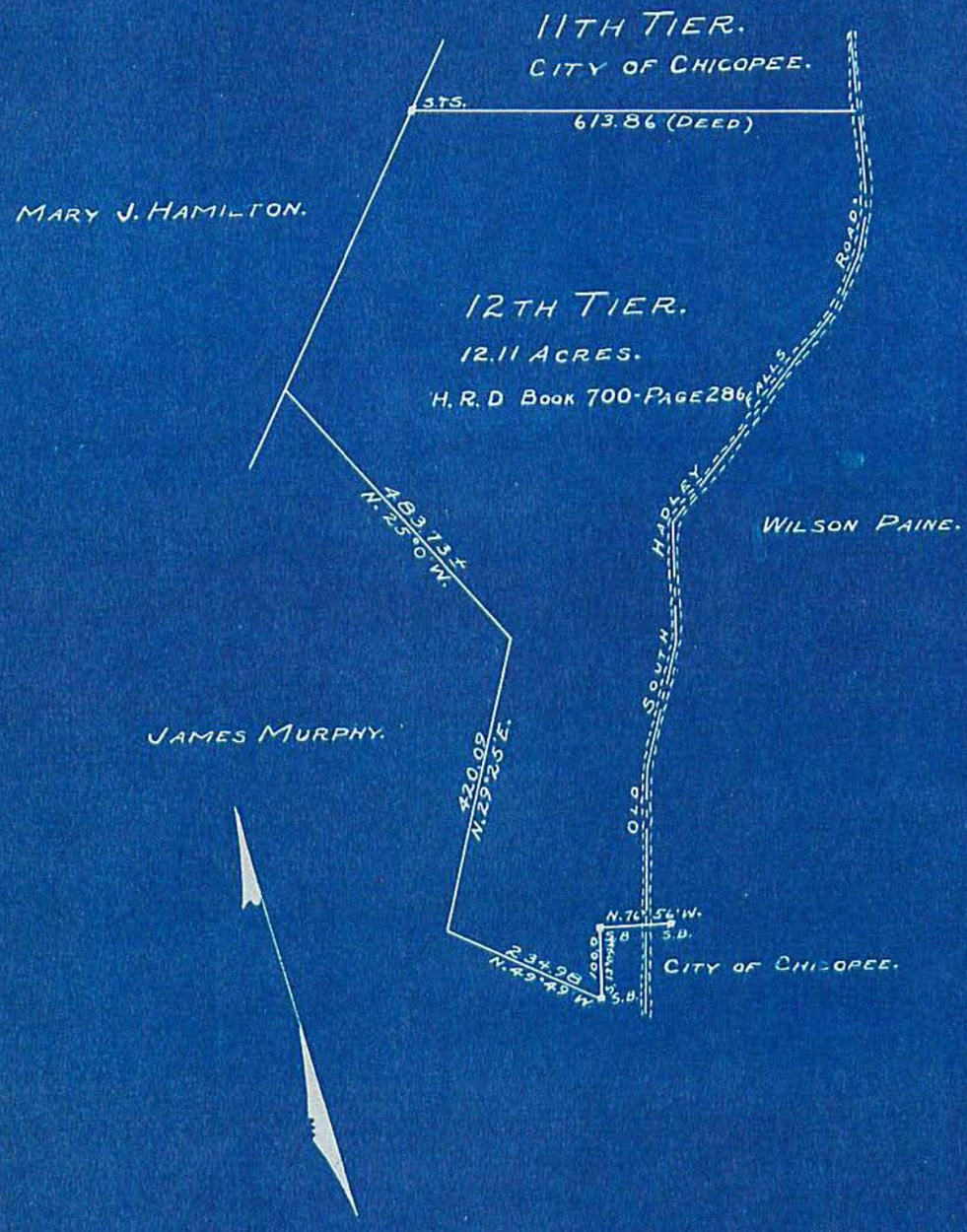
Mary J: Hamilton to City of Chicopee.

Beginning at a stone bound at the South West corner of the land belonging to the City of Chicopee, being also the North West corner of land of James Murphy; being also on the Northerly line of tier No.12; thence running South Westerly along land of said James Murphy; thence running North 35° 14' West, about 405.0 feet to a point; thence Easterly about 530.0 feet to the point of beginning.

Parcel #2

Beginning at a point on the Northerly line of land owned by the City of Chicopee, said point being about 580.0 feet North Easterly from a stone bound at the North Westerly corner of land owned by James Murphy; thence North 12° 17' East, about 240.0 feet to a point; thence North 67° 59' East, about 250.0 feet to land of the City of Chicopee; thence South Westerly by land of said City to the point of beginning.

The amount of land contained in parcels one and two is 2.54 acres, more or less.



PLAN OF LAND IN CHICOPEE, MASS.

OWNED BY

JAMES MURPHY,

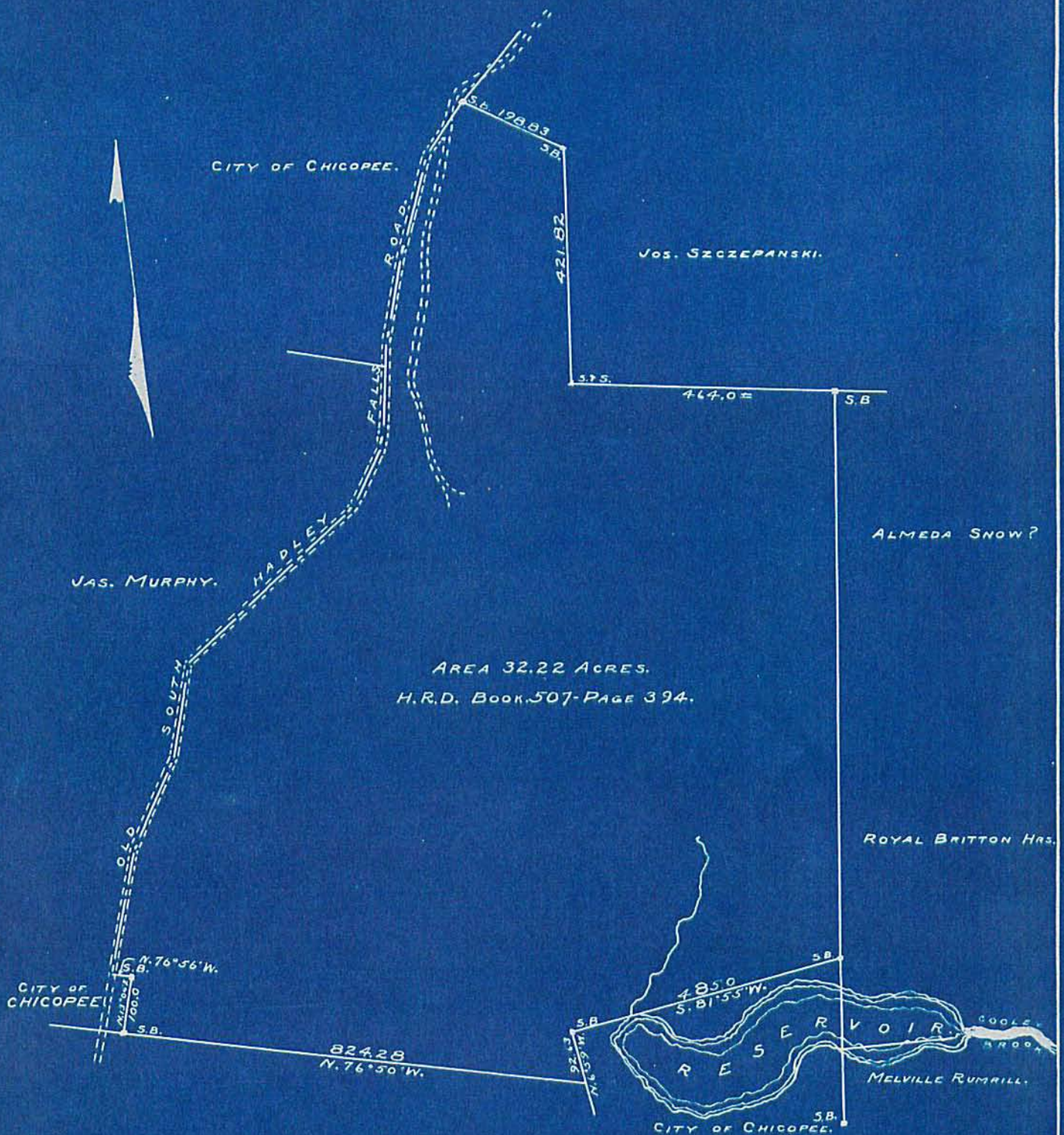
CHICOPEE, MASS.

SCALE: 1 IN. = 200 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

James Murphy to City of Chicopee.

Beginning at a stake and stone, said point being on the North line of tier No.12 at the South West corner of land of City of Chicopee; thence running East of it along the Southerly bound of the City of Chicopee, 613.86 feet to the center of the old South Hadley Falls Road; thence Southerly along said center of said road to other land of City of Chicopee, known as the Morton Brook Reservoir Lot; thence North Westerly to the North West corner of said lot; thence South 13° 4' West, 100.0 feet to a stone bound; thence North 49° 49' West, 234.98 feet to a point; thence North 29° 25' East, 420.09 feet to a point; thence North 25° no minutes West, about 483.73 feet to land of Mary J. Hamilton: Thelast three courses are on land of grantor; thence North Easterly to the point of beginning, containing 12.11 acres, being a portion of land conveyed by Lucien D. Lyon to James Murphy, H.R.D., book 700, page 286.



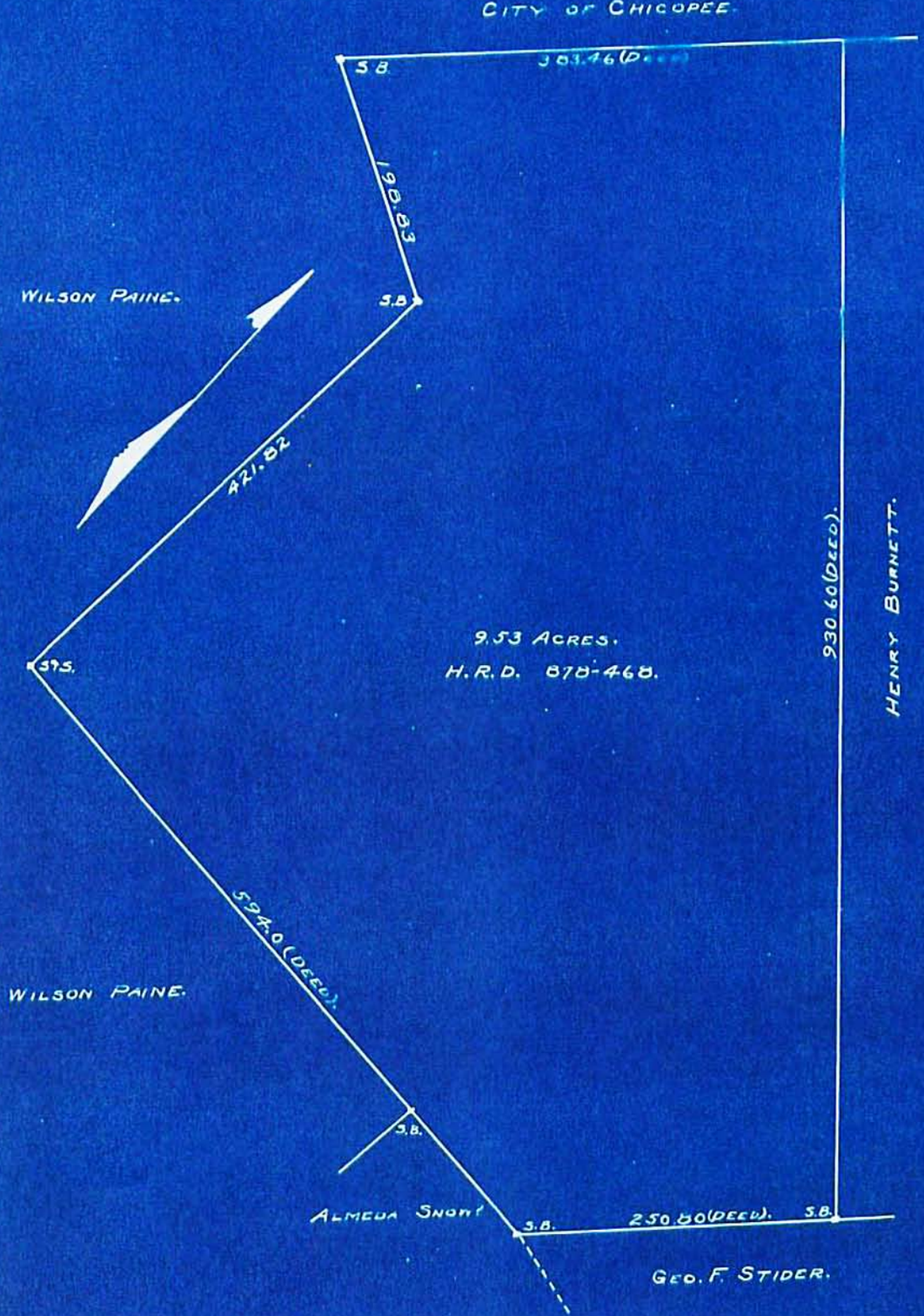
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
WILSON PAINE,
CHICOPEE, MASS.

SCALE:- 1 IN. = 200 FT. JUNE - 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Wilson Paine to City of Chicopee.

Beginning at stone bound, said point being the North Easterly corner of land owned by City of Chicopee, known as the Cooley Brook Reservoir Lot; thence running South 81° 55' West, 485.0 feet to a stone bound, said point being the North West corner of said reservoir lot; thence South 6° 59' East, 92.63 feet to a point; thence North 76° 50' West, 824.28 feet to a stone bound, said point being the South East corner of land owned by the City of Chicopee, known as the Morton Brook Reservoir; thence North 13° 4' East, 100.0 feet to a stone bound, said point being the North Easterly corner of Morton Brook Reservoir lot; thence North 76° 56' West to the center of Old South Hadley Falls Road, so called; thence North Easterly along center of said road to a stone bound at land of Joseph Szczepanski, formerly of one Godek; thence South Easterly 198.83 feet to a stone bound; thence Southerly 421.82 feet to a stake and stone; thence Easterly about 464.0 feet to a stone bound at land supposed to be owned by Almeda Snow. the last three courses being along land of said Joseph Szczepanski; thence Southerly along land of Almeda Snow and Royal Britton heirs to place of beginning, containing 32.22 acres and being land described in deed of Harriet A. Fuller to Wilson Paine, H.R.D., book 507, page 934.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
JOS. SZCZEPANSKI,
CHICOPEE, MASS.

SCALE:- 1 IN. = 100 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Joseph Szczepanski to City of Chicopee.

Beginning at a stone bound on the old South Hadley Road at land of Wilson Paine and City of Chicopee; thence running North Easterly along land of said City of Chicopee, 383.46 feet to land of Henry Burnett; thence South Easterly along said Burnett 930.60 feet to stone bound at land supposed to be of George F. Stider; thence South Westerly 250.80 feet to a stone bound at land supposed to be of Almeda Snow; thence North Westerly 594.0 feet along land of said Snow and Wilson Paine to stake and stone; thence Northerly 421.82 feet to a stone bound; thence North Westerly 198.83 feet to the point of beginning. The last three courses being along land owned by Wilson Paine, containing 9.53 acres, being a portion of land conveyed from one Godek to Joseph Szczepanski, H.R.D., book 878, page 468.

CITY OF CHICOPEE.

793.98

S.B.

VOS. SZCZEPANSKI.

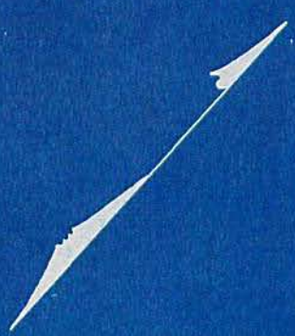
932.58

DISTANCES TAKEN FROM DEED. H.R.D. 478-472

AREA 17.21 ACRES ±.

932.58 (DEED) S.41°32'E.
951.58 MEASURED.

FRANK LUSNIA.



S.B.

793.98

S.&S.

GEO. F. STIDER.

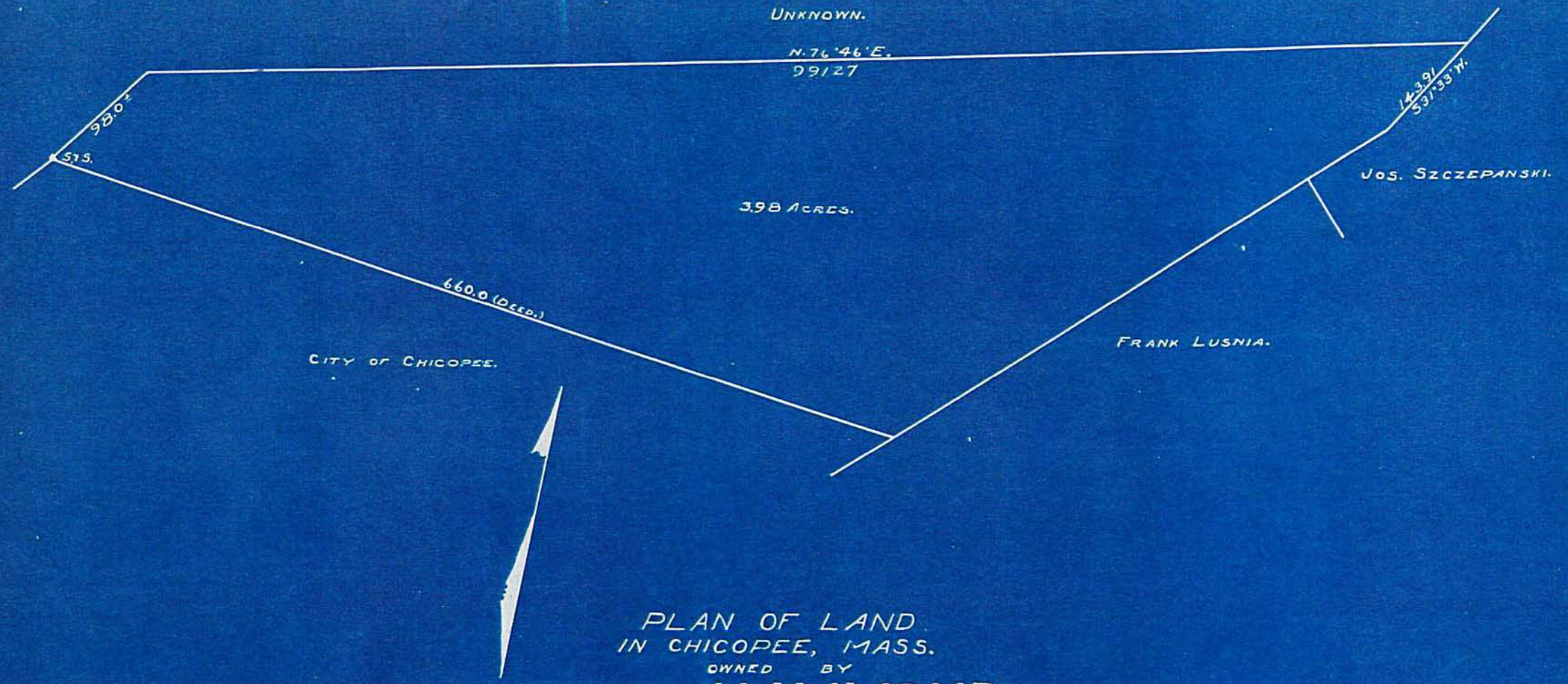
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
HENRY A. BURNETT,
CHICOPEE, MASS.

SCALE:- 1 IN. = 100 FT. JUNE, 1914.

COBB, BEESLEY & MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Henry Burnett to City of Chicopee.

Beginning at a stone bound said point being the North East corner of land herein conveyed, also the North West corner of land of Frank Lusnia; thence running South Easterly along land of said Lusnia, 951.58 feet to a stake and stone at land supposed to be of George F. Stider; thence South Westerly 793.98 feet to a stone bound at land of Joseph Szczepanski; thence North Westerly along land of said Joseph Szczepanski, 932.58 feet to land of City of Chicopee; thence North Easterly along land of said City of Chicopee, 793.98 feet to point of beginning, containing about 17.21 acres, being land conveyed from Locero J. Gibbs to Henry A. Burnett. H.R.D., book 478, page 472.



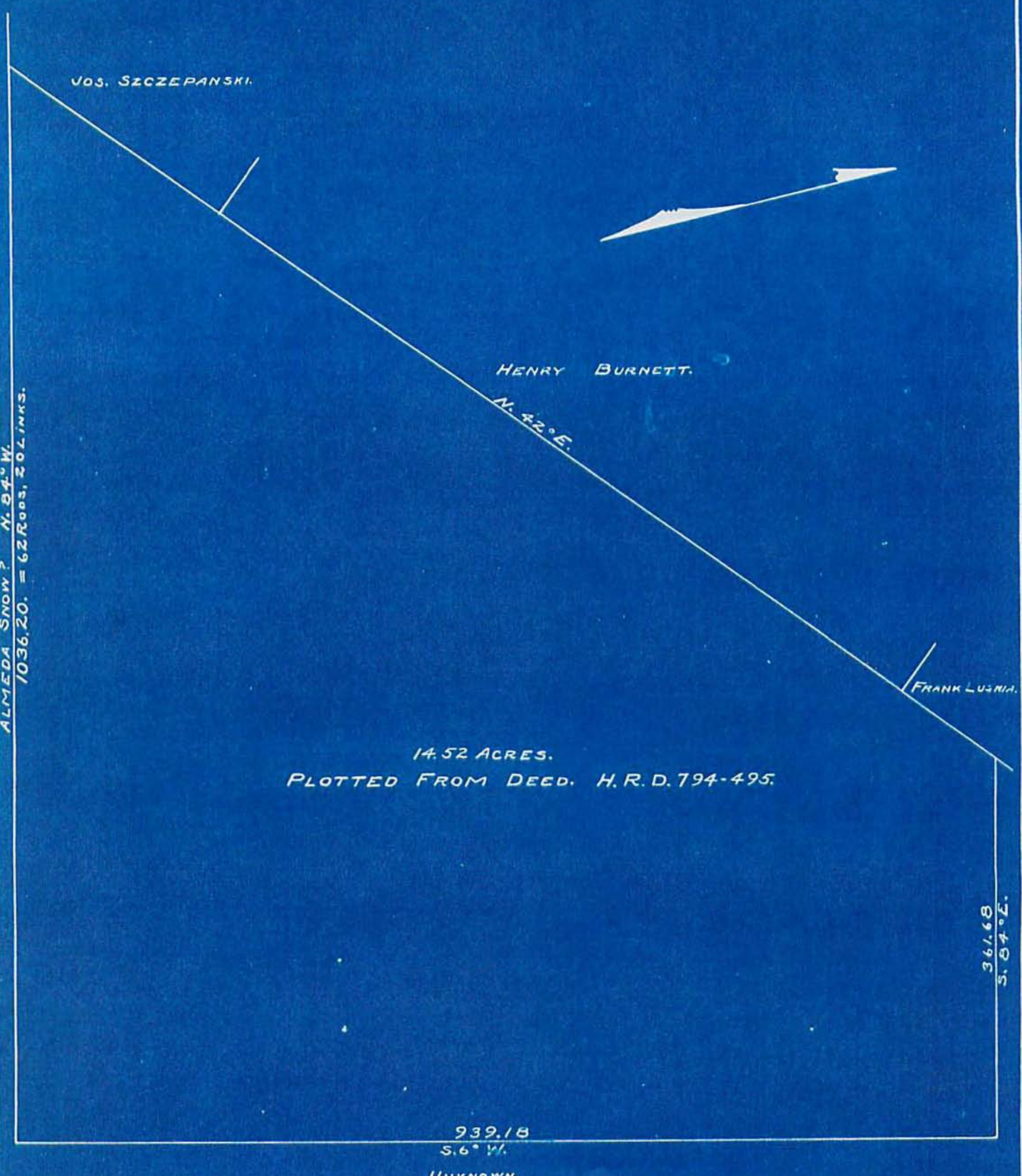
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
HAMMOND,

SCALE:- 1 IN. = 80 FT. JUNE, 1914.

COBB, BEESLEY & MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Hammond to City of Chicopee.

Beginning at a stake and stone marking the North West corner of land owned by the City of Chicopee, formerly the Carver lot, and running thence North Easterly about 98.0 feet to a point; thence running North 76° 46' East, 991.27 feet to land of Joseph Szczepanski; thence South 31° 33' West by land of said Szczepanski, 143.91 feet to a point; thence running South Westerly by land of said Szczepanski and Frank Lusnia to the North Easterly corner of land of said City of Chicopee; thence Westerly by land of said City of Chicopee, 660.0 feet to point of beginning. Containing about 3.98 acres of land.



14.52 Acres.

Plotted From Deed. H.R.D. 794-495.

PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

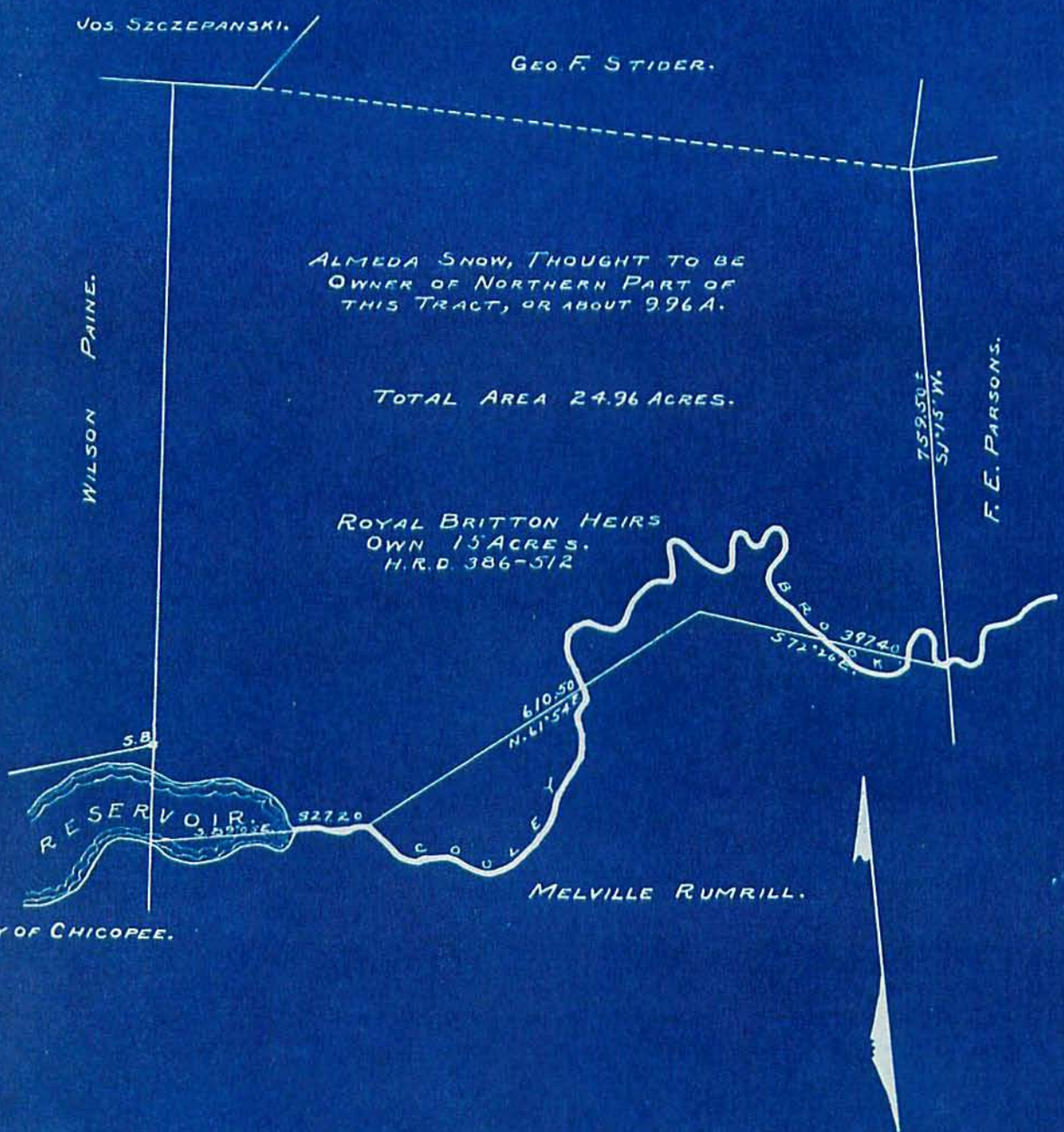
GEO. F. STIDER,
WINSTEAD, CONN.

SCALE:- 1 IN. = 100 FT. JUNE, 1914.

COBB, BEESLEY & MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

George F. Stider to City of Chicopee.

Beginning at the North West corner of land of F. E. Parsons; running thence North 84° West, 62 rods and 20 links, by land formerly of Brigham Day, now thought to be of one Almeda Snow, thence North 42° East by land of Joseph Szczepanski, Henry Burnett and Frank Lusnia, to a point; thence South 84° East, 21 rods, 23 links(361.68 feet) by land formerly of said Day; thence South 6° West, 56 rods, 23 links (939.18 feet) by land formerly owned by L.Keith and Churchill Snow, to point of beginning. Containing about 14.52 acres, and being land sold to G. & M. Stider from J. Beaulieu, H.R.D.,book 794, page 495.



PLAN OF LAND IN CHICOPEE, MASS.

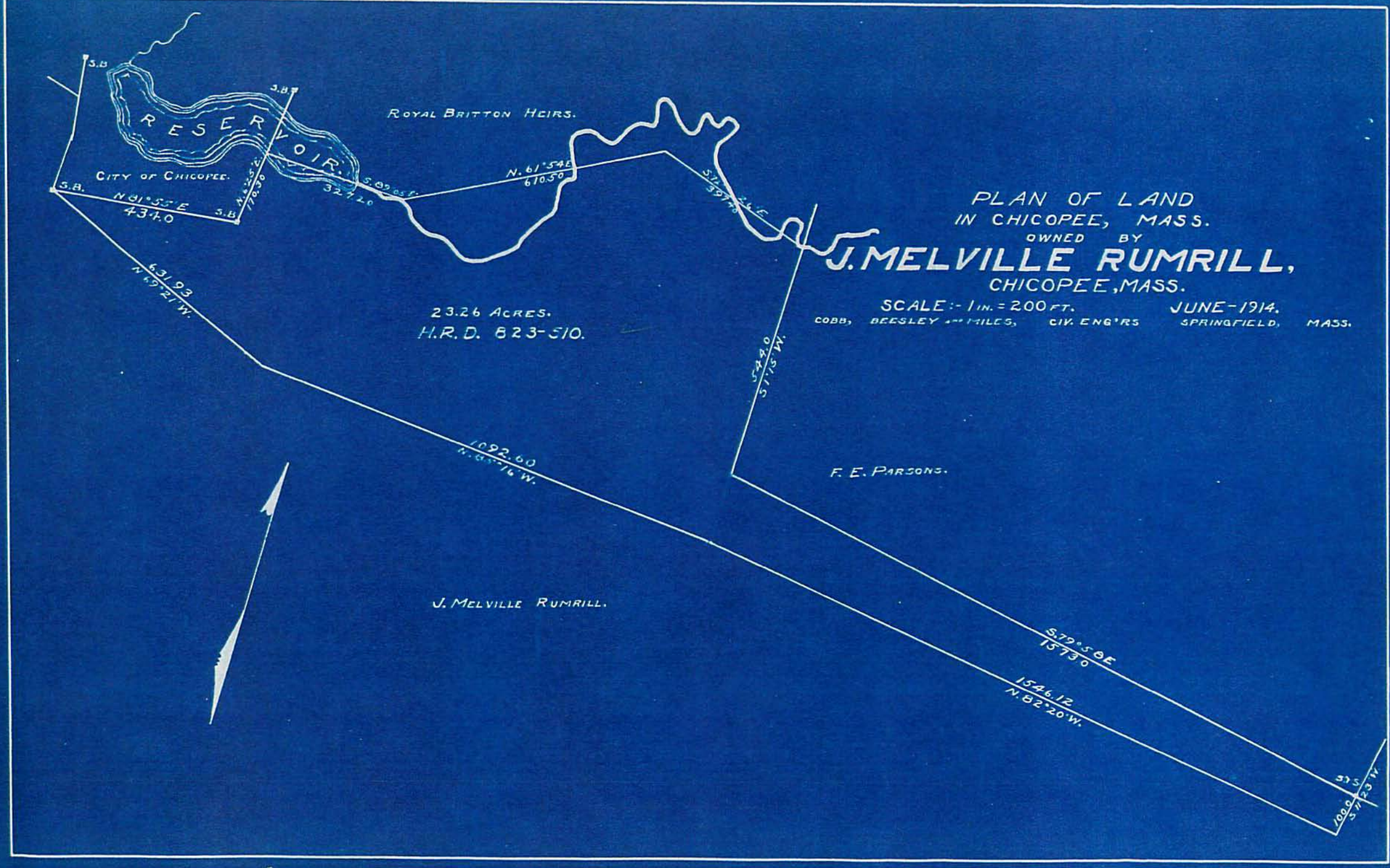
SCALE:- 1 IN. = 200 FT. JUNE, 1914.

COBB, BEESLEY & MILES, CIV. ENG'RS, SPRINGFIELD, MASS.

Royal Britton Heirs to City of Chicopee.

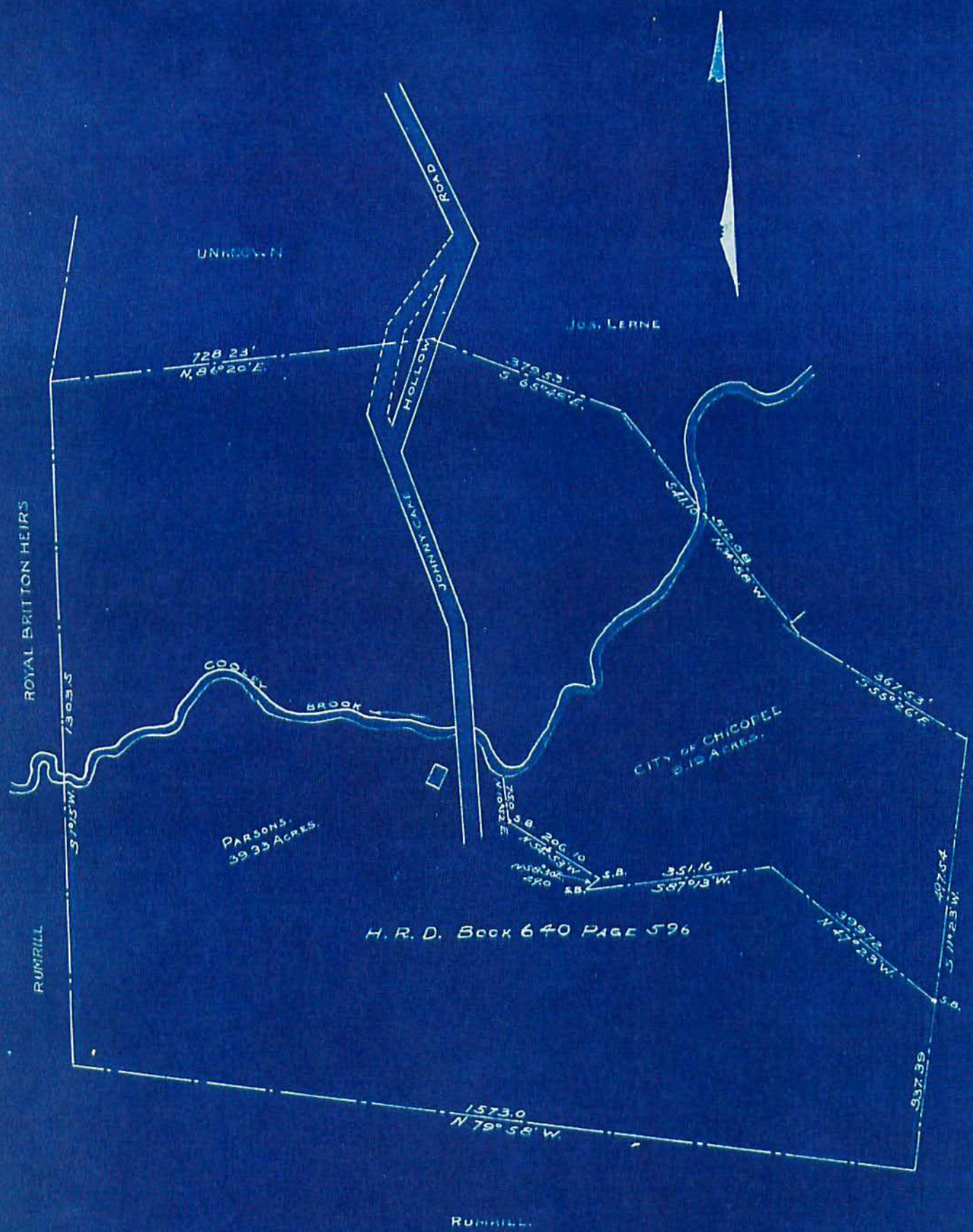
Being the Southerly part of a tract of land conveyed to Brigham Day by John J. Crandall and his wife Abigail L. Crandall, commencing on the Southerly line of said tract near the brook and extending Northerly the whole width of said BrighamDay's lot, so far as to enclose 15 acres, bounded Easterly on land now, or formerly occupied by one Snow, 27 rods. Westerly on the Burt lot, so called, 34 rods; South on land now, or formerly, of one Caulkins, 85 rods; and Northerly on land of said Day, 74 rods. Said premises conveyed to Albert Morton by deed H.R.D., book 205, page 361.

This description being taken from deed conveyed to Royal Britton by Clarence H. & Henry W. Morton, H.R.D.,book 386, page 512.


S.B
S.B
S.B
S.B
RESERVOIR.
CITY OF CHICOPEE.
ROYAL BRITTON HEIRS.
N. 61° 54' E
610.50
S. 09° 05' E.
327.20
N. 81° 55' E
434.0
170.30
631.93
N. 69° 21' W.
1092.60
N. 65° 16' W.
544.0
S. 11° 15' W.
23.26 ACRES.
H.R.D. 823-510.
F. E. PARSONS.
J. MELVILLE RUMRILL.
S. 79° 5' 8E
1573.0
1546.12
N. 82° 20' W.
S. 11° 23' W.
1000.0
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
J. MELVILLE RUMRILL,
CHICOPEE, MASS.
SCALE:- 1 IN. = 200 FT.
JUNE-1914.
COBB, BEESLEY & MILES, CIV. ENG'RS SPRINGFIELD, MASS.

J. Melville Rumrill, et al, to City of Chicopee.

Beginning at a stone bound said point being the South West corner of land owned by the City of Chicopee, known as the Cooley Brook Reservoir Lot; thence running North 81° 55' East, 434.0 feet to a stone bound, said point being the South Easterly corner of said reservoir lot; thence North 6° 25' East, 170.30 feet to the land of Royal Britton heirs; thence South 89° 5' East, 327.20 feet; thence North 61° 54' East, 610.50 feet; thence South 72° 26' East, 397.48 feet to land of F. E. Parsons. The last three courses being along land owned by Royal Britton heirs; thence South 1° 15' West, 544.0 feet to a stake and stone; thence South 79° 58' East, 1573.0 feet to a stake and stone to land of Mary J. Hamilton. The last two courses being along land of F. E. Parsons; thence South 11° 23' West, 100.0 feet; thence North 82° 20' West, 1546.12 feet; thence North 85° 16' West, 1092.60 feet, thence North 69° 21' West, 631.93 feet to the point of beginning. The last four courses being along land owned by J. Melville Rumrill, et al, containing 23.26 acres, being a portion of land conveyed from one Fuller to J. Melville Rumrill, et al, H.R.D., book 823, page 510.



PLAN OF LAND

OWNED BY

F. E. PARSONS

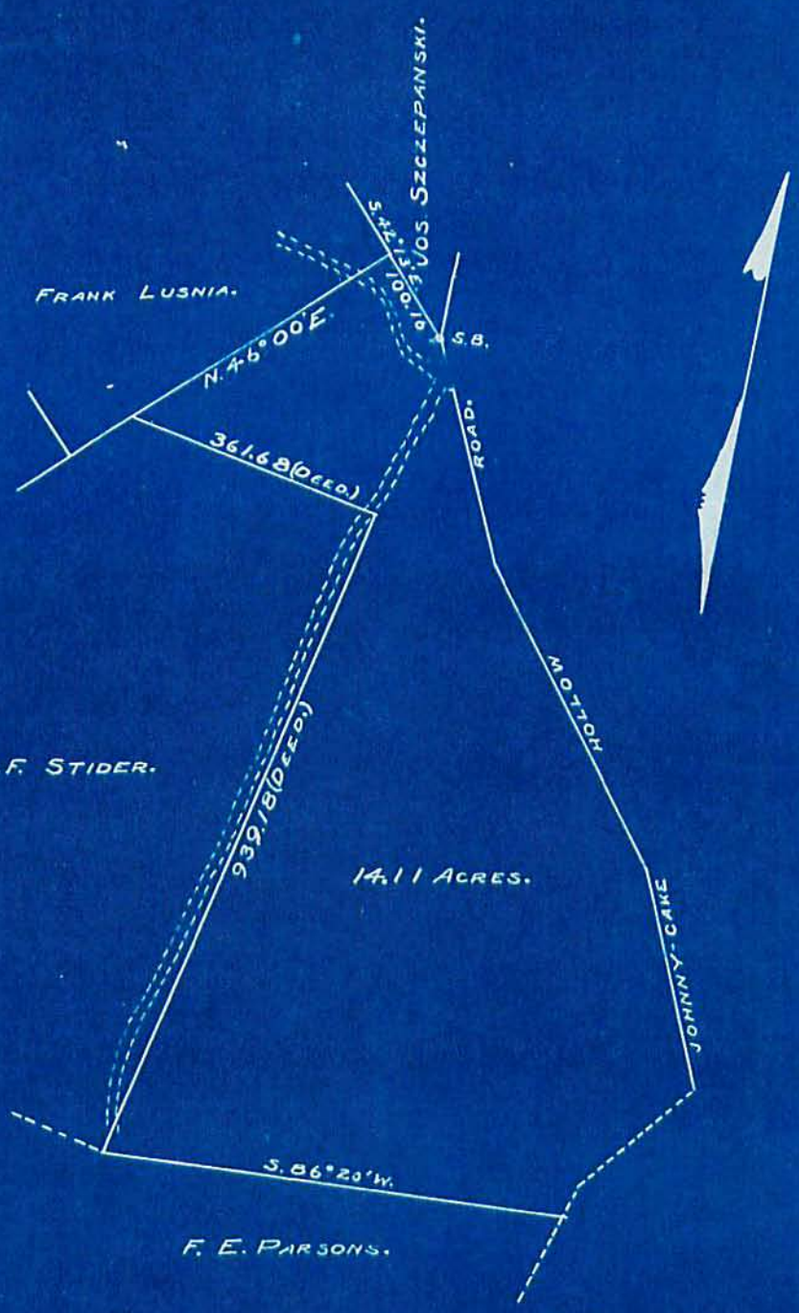
CHICOPEE, MASS.

SCALE: 1" = 200' MAY 1914.

W. S. B. & E. E. SLATE & MILES CIVIL ENGRS.
SPRINGFIELD, MASS.

F. E. Parsons to the City of Chicopee.

Beginning at a point in the center of Cooley Brook so called at land of Joseph Lerne; thence running North 34° 58' West, about 240.0 feet to an iron pin near a pine tree standing on the top of the hill; thence along land of said Lerne North 65° 49' West, 379.54 feet to an iron pin in the Easterly line of the road known as Johnny-Cake Hollow Road; thence South 86° 20' West across said road and by land of party unknown, 728.23 feet to a corner of land thought to be owned by Almeda Snow; thence South 1° 15' West along land of said Snow, 759½ feet to Cooley Brook; thence continuing the same course by land of one Rumrill 544.0 feet to a point; thence South 79° 58' East, 1573.0 feet along the Northerly line of said Rumrill to stake and stones at the South West corner of land owned by Mary J. Hamilton; thence North 11° 23' East by land of said Hamilton, 337.39 feet to a stone bound at the South Easterly corner of land owned by the City of Chicopee; thence North 47° 23' West, 399.72 feet toa stake; thence South 87° 13' West, 351.16 feet to a stone bound; thence North 58° 30' East, 29.0 feet to a stone bound; thence North 54° 53' West, 206.10 feet to a stone bound; thence North 10° 52' East, 75.0 feet to the center of said Cooley Brook. The last five courses bounding on the City of Chicopee; thence North Easterly by the center of said Brook to the point of beginning, said contract containing about 39.33 acres of land, and being land conveyed to said Parsons in deed H.R.D., book 640, page 596.



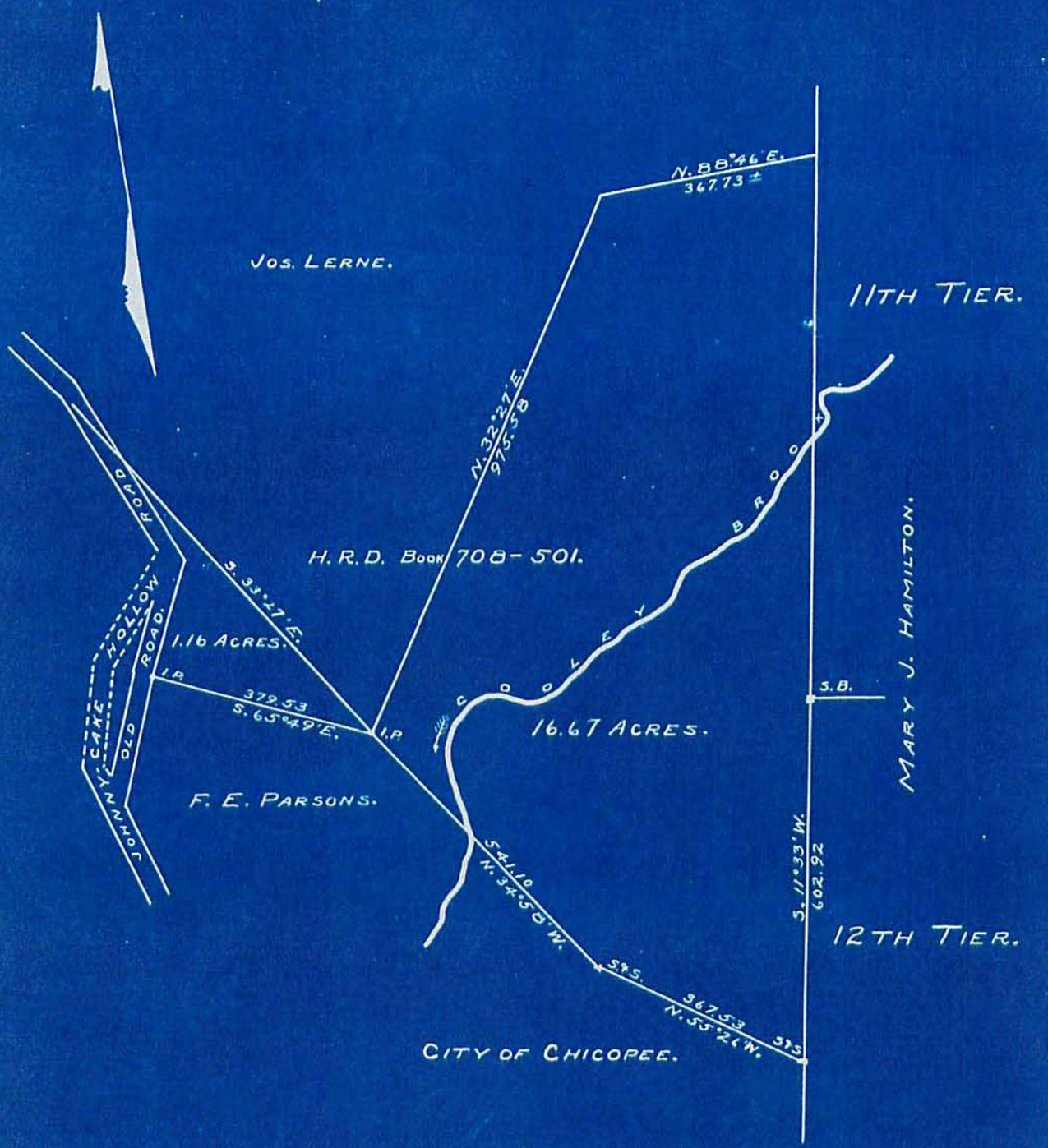
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
UNKNOWN

SCALE:- 1 IN. = 200 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Unknown to City of Chicopee.

Beginning at a stone bound on the Westerly side of Johnny-Cake Hollow Road at land of Joseph Szczepanski; thence running Southerly along the Westerly line of said road to land of F. E. Parsons; thence 86° 20' West to land supposed to be of George F. Stider, being also the North West corner of land of said Parsons; thence Northerly 939.18 feet to a point; thence Westerly 361.68 feet to land of Frank Lusnia. The last two courses being along land ofsaid Stider; thence North 46° no minutes East, to stake and stone at land of Joseph Szczepanski; thence South 42° 13' East, 100.16 feet to point of beginning, containing 14.11 acres.



PLAN OF LAND IN CHICOPEE, MASS.

OWNED BY

JOS. LERNE,

CHICOPEE, MASS.

SCALE: 1 IN. = 200 FT. JUNE - 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Joseph Lerne to City of Chicopee.

Beginning at an iron pin on the Easterly side of Johnny-Cake Hollow Road, and running thence South 65° 49' East by land of F. E. Parsons, 379.53 feet to an iron pin near a pine tree on top of the hill; thence North 33° 27' West to the Easterly side of said Johnny-Cake Hollow Road; thence South by the Easterly side of said road to point of beginning, containing about 1.16 acres.

Second Parcel

Beginning at a stake and stone in the North East corner of land owned by the City of Chicopee, being in the 12th tier on the line betweenland of City of Chicopee and Mary J. Hamilton, and running thence North 55° 26' West, 367.53 feet to a stake and stone; thence running North 34° 58' West, crossing Cooley Brook 541.10 feet to an iron pin on top of hill.

The last two courses by land of City of Chicopee and F. E. Parsons; thence North 32° 27' East, 975.58 feet to a point; thence North 88° 46' East, about 367.73 feet to land of Mary J. Hamilton in the 11th tier; thence South by land of Mary J. Hamilton again crossing said Cooley Brook to a stone bound, marking the line between the 11th and 12th tiers; thence South 11° 33' West, 602.92 feet to point of beginning. Containing about 16.67 acres.

The above two parcels being part of land conveyed to Joseph Lerne by Quartus J. Smith Estate, H.R.D.,book 708, page 501.

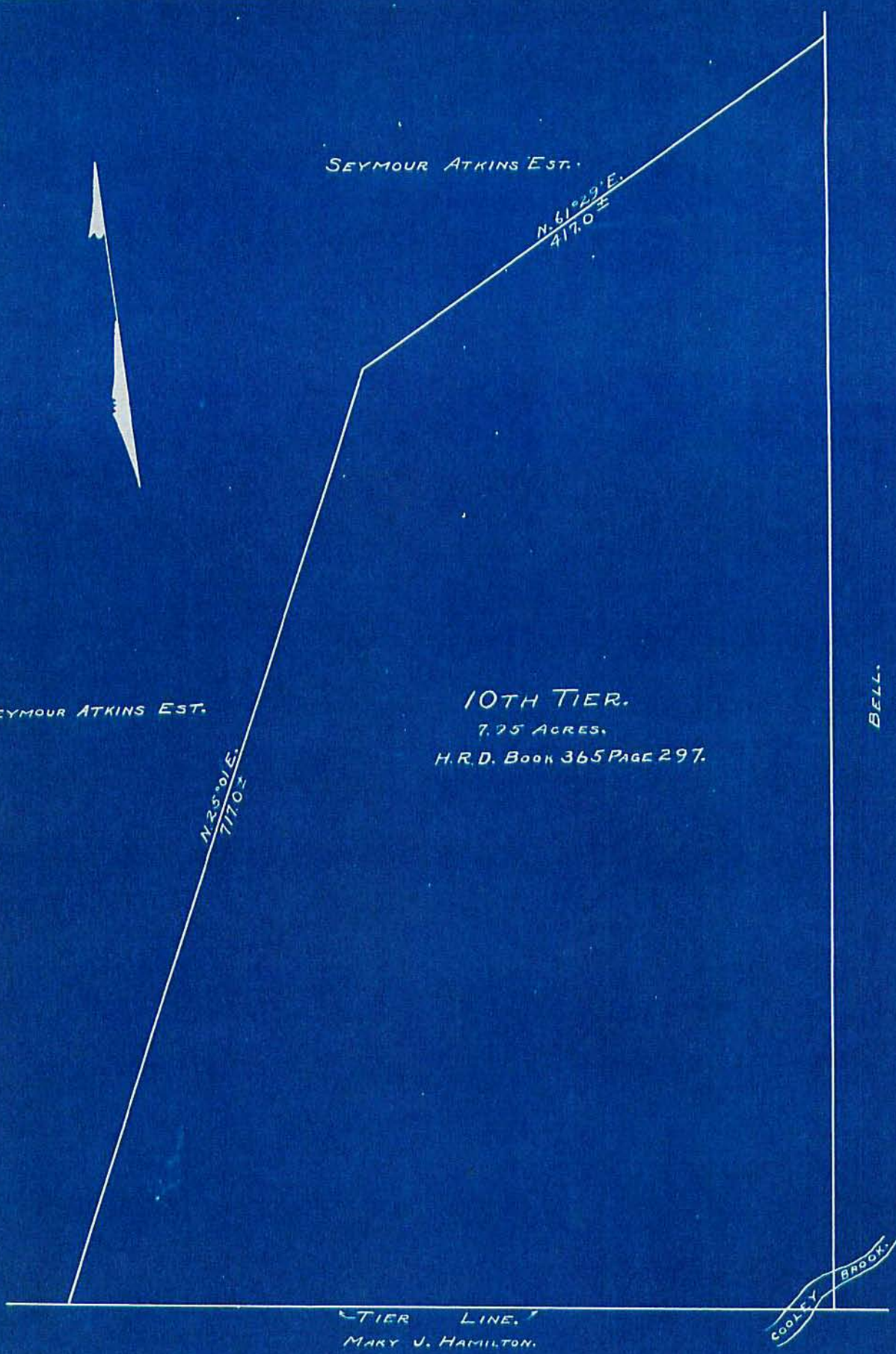
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
MARY J. HAMILTON,

SCALE:- 1 IN. = 200 FT. JUNE-1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Mary J. Hamilton to City of Chicopee.

Beginning at a stone bound in the Southerly line of the 11th tier at land of Joseph Lerne, and running thence Northerly by land of said Lerne crossing Cooley Brook to the Northerly line of said 11th tier, and running thence Easterly by said tier line along land of owner uhknown, Estate of Seymour D. Atkins and Thomas J. Bell Estate, again crossing Cooley Brook to stone bound at land of Goodman Burnett; thence South 7 degrees, 52 minutes West, 1506.43 feet to a stone bound on the Southerly line of said tier at other land owned by said Mary J. Hamilton; thence North 81 degrees, 50 minutes West by said tier line, 1852.40 feet to point of beginning. Containing about 61.50 acres.



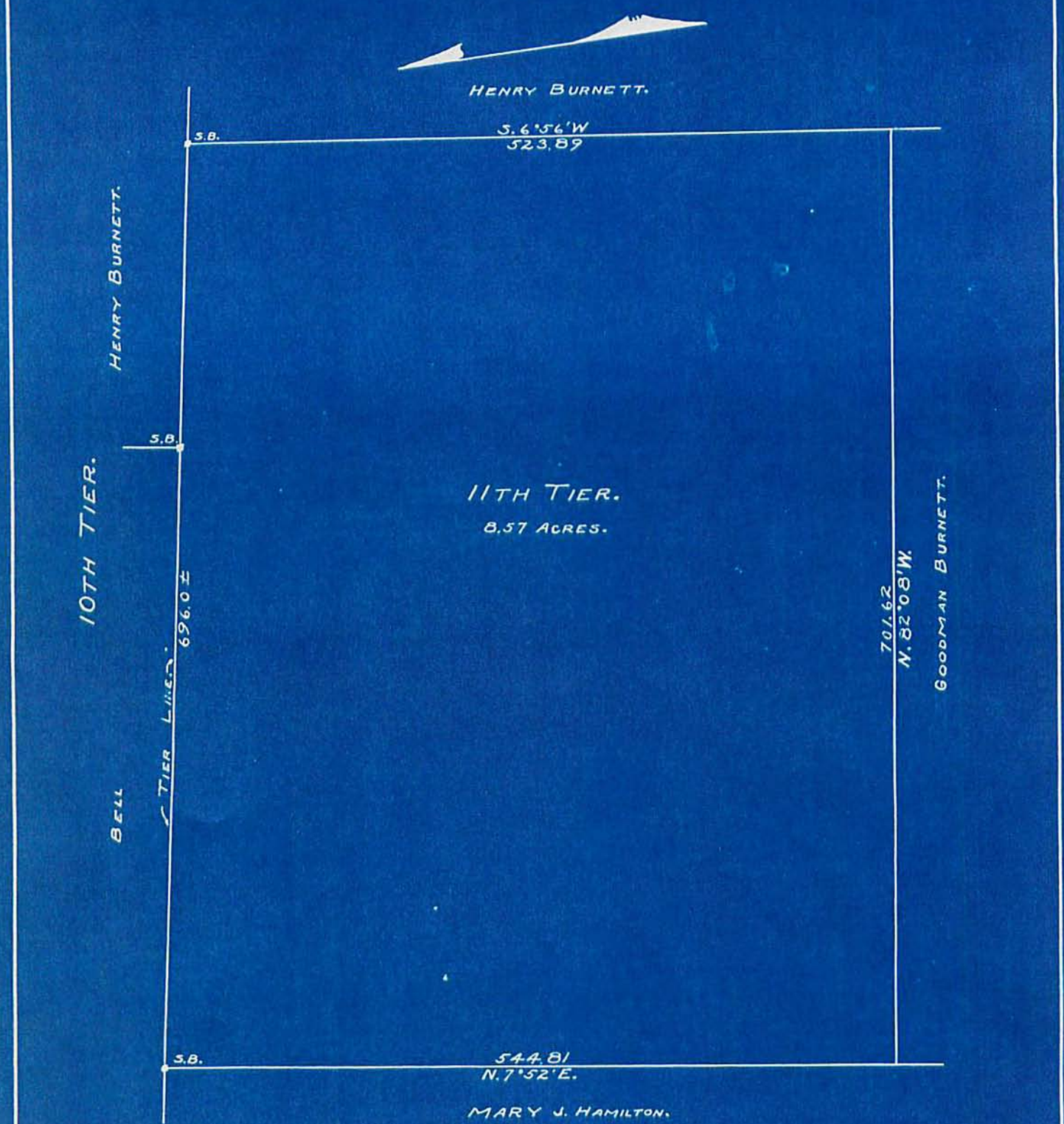
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
SEYMOUR ATKINS EST.,
CHICOPEE, MASS.

SCALE:- 1 IN. = 80 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Seymour D. Atkins Estate to City of Chicopee.

Beginning on the Southerly line of the 10th tier, about 813.0 feet Easterly of the North East corner of land owned by Joseph Lerne; thence running North 25° 1' East, about 717.0 feet; thence North 61° 29' East, about 417.0 feet to line between Seymour D. Atkins Estate and Thomas J. Bell Estate. The last two courses being along land of said Atkins; thence Southerly by land of said Bell to a point near Cooley Brook, and being the South West corner of land owned by said Bell, and being on the Southerly line of said 10th tier; thence running Westerly along said tier line by land of Mary J. Hamilton to point of beginning. Containing about 7.95 acres, and being land described in H.R.D., book 365, page 297, to Seymour D. Atkins Estate from Frank P. Keyes.



PLAN OF LAND IN CHICOPEE, MASS.

OWNED BY

GOODMAN BURNETT,

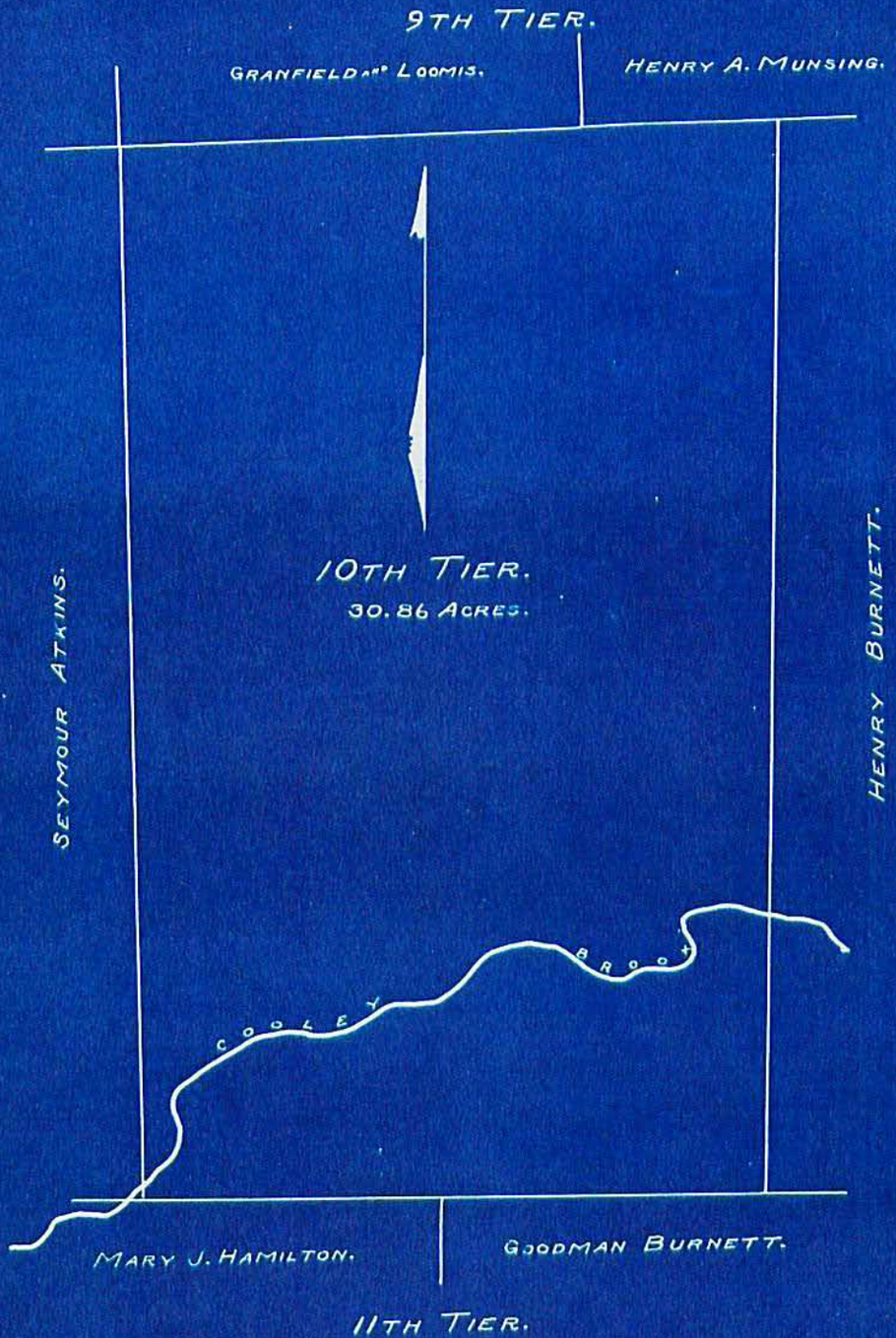
CHICOPEE, MASS.

SCALE: 1 IN. = 80 FT. JUNE-1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS, SPRINGFIELD, MASS.

Goodman A. Burnett to City of Chicopee.

Beginning at a stone bound on the Northerly line of the 11th tier being the North East corner of land owned by Mary J. Hamilton in the said 11th tier; and running Easterly along the Northerly line of said tier by land of Hiram W. Bell, and Henry Burnett, about 696.0 feet to a stone bound; thence South 6° 56' West, 523.89 feet by other land of Henry Burnett to a point; thence North 82° 8' West by land of said Goodman Burnett, 701.62 feet to a point on line between land of Mary J. Hamilton and said Goodman Burnett; thence North 7° 52' East, 544.81 feet to point of beginning. Containing about 8.57 acres.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

HIRAM W. BELL,

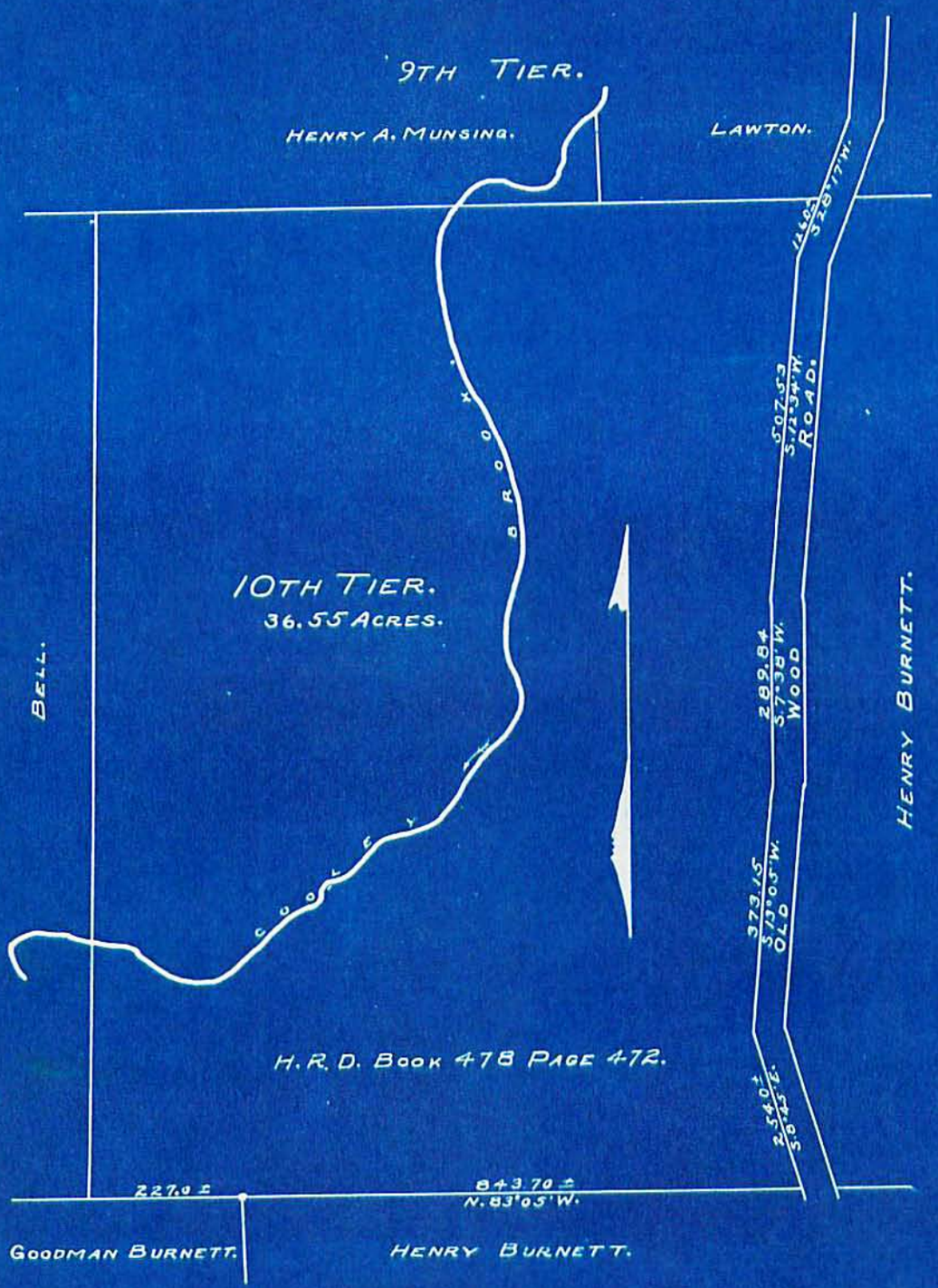
SPRINGFIELD, MASS.

SCALE:- 1 IN. = 200 FT. JUNE - 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Hiram W. Bell to City of Chicopee.

Beginning at a stone bound in the Southerly part of the 10th tier, and being the South West corner of land owned by Henry Burnett, and running thence Westerly on the Southerly line of 10th tier to a point near Cooley Brook, being the South East corner of land owned by Seymour D. Atkins Estate, thence Northerly to the Northerly line of said 10th tier to land of Granfield & Loomis; thence Easterly on the Northerly line of said tier by land of Granfield & Loomis and Henry A. Munsing to a point, being the North West corner of said Henry Burnett's land; thence Southerly along land of said Burnett, crossing Cooley Brook to point of beginning. Containing about 30.86 acres of land.



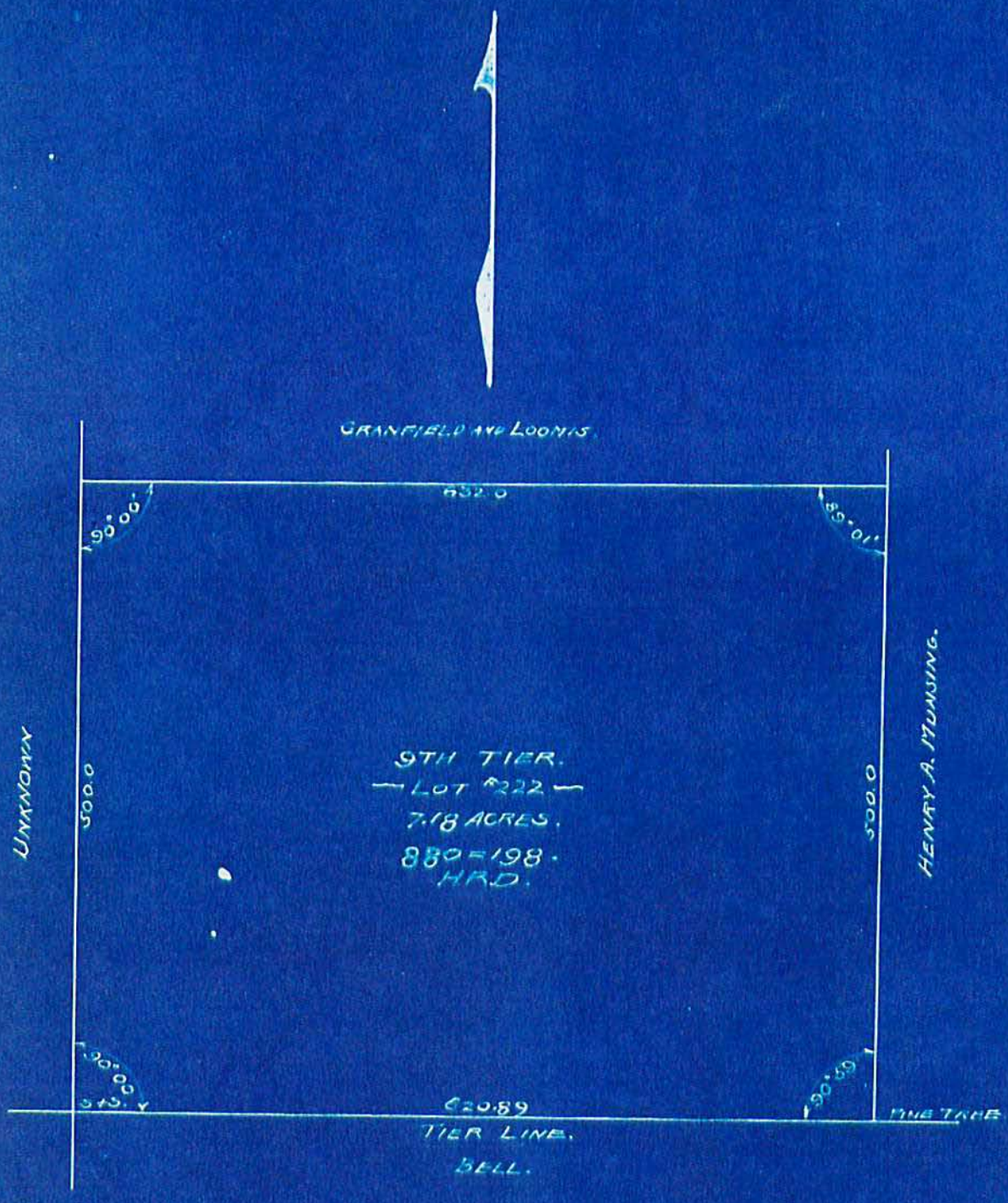
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
HENRY BURNETT,
CHICOPEE, MASS.

SCALE:- 1 IN. = 200 FT. JUNE-1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Henry Burnett to City of Chicopee.

Beginning at the intersection of the line between the 9th and 10th tiers and the Westerly side of old wood road; thence running South 28° 17' West, about 126.0 feet; thence South 12° 34' West, 507.53 feet; thence South 7° 38' West, 289.84 feet; thence South 13° 5' West, 373.15 feet; thence South 8° 45' East, about 254.0 feet, being the intersection of the line between the 10th and 11th tiers with the Westerly side of said old wood road, and the last five courses being the Westerly side of said old wood road; thence North 83° 5' West, about 843.70 feet to a stone bound on the Southerly line of the 10th tier, being the North West corner of other land of Henry Burnett; thence continuing Westerly on same tier line about 227.0 feet by land of Goodman Burnett to the South East corner of land formerly owned by Thomas J. Bell Estate; thence Northerly by land of said Bell crossing Cooley Brook to the Northerly line of the said 10th tier; thence Easterly on said tier line by land of Henry A. Munsing, again crossing Cooley Brook and land of one Lawton, to the point of beginning. Containing about 36.55 acres of land, and being land conveyed to said Henry Burnett by deed H.R.D., book ~~478~~, page ~~472~~. 994-5



10TH TIER.

PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

GRANFIELD AND LOOMIS,

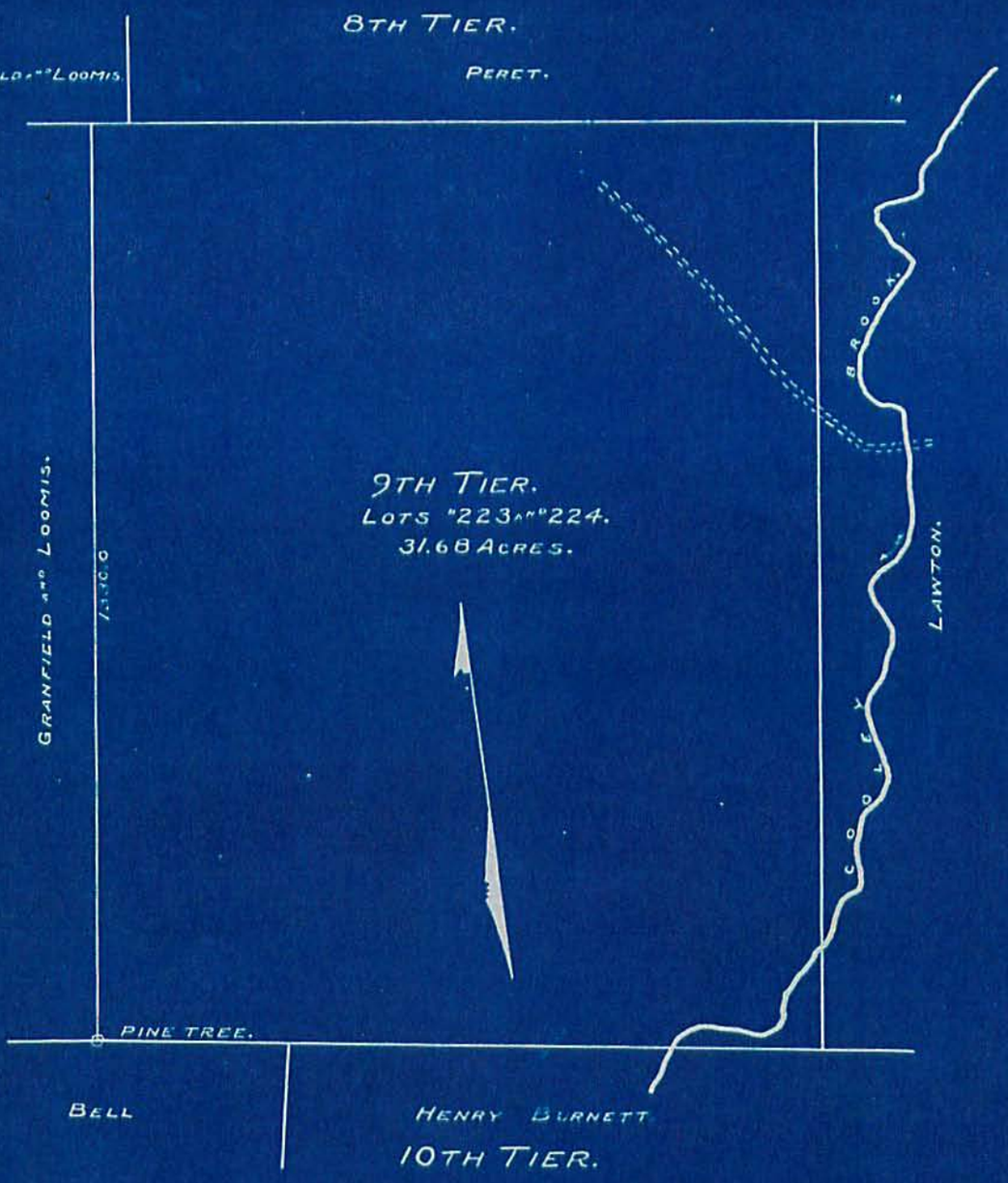
CHICOPEE, MASS.

SCALE 1 IN = 100 FT. JUNE-1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS, SPRINGFIELD, MASS.

Granfield & Loomis to City of Chicopee.

Beginning at a pine tree that is on the Southerly line of the 9th tier, the same being the South Westerly corner of land owned by Henry A. Munsing; and running thence Westerly on the said tier line 620.89 feet to a stake and stone; thence Northerly at right angles to said tier line, 500.0 feet by land of owner unknown to a point; thence Easterly at right angles about 632.0 feet to land of Henry A. Munsing; thence Southerly by an included angle of 89° 1', 500.0 feet to point of beginning. This is intended to convey the Southerly portion of land conveyed to Granfield & Loomis, said land being in the 9th tier and being lot #222, as per deed H.R.D., book 880, page 198. Containing about 7.18 acres of land.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

HENRY A. MUNSING,

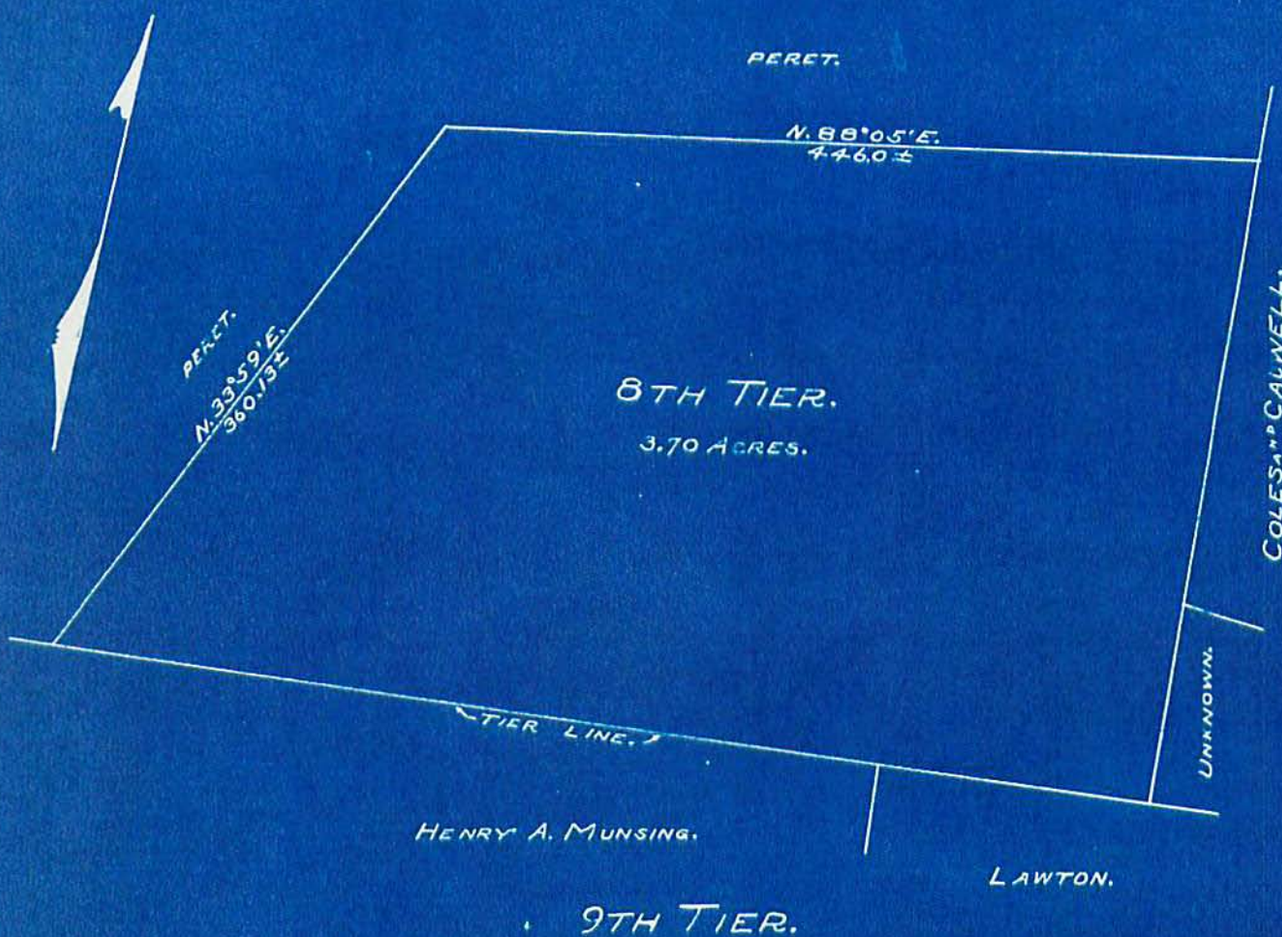
LUDLOW, MASS.

SCALE:- 1 IN. = 200 FT. JUNE-1914.

COBB, BEESLEY & MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Henry A. Munsing to City of Chicopee.

Beginning at a pine tree, said tree being on the Southerly line of the 9th tier, and being the South Easterly corner of land owned by Granfield & Loomis; and running thence Northerly by land of said Granfield & Loomis, 1330.0 feet to a point on the Northerly line of said 9th tier; thence Easterly by said North line of said 9th tier by other land of Granfield & Loomis and land of one Peret, crossing Pendleton Avenue to the North West corner of land of one Lawton; thence Southerly by land of said Lawton, again crossing said Pendleton Avenue, also crossing Cooley Brook, to the South West corner of land of said Lawton, and being in the Southerly line of the said 9th tier; thence Westerly by land of Henry Burnett again crossing Cooley Brook and land of Hiram W. Bell, to point of beginning, being lots No.223 and 224 in the 9th tier and containing about 31.68 acres of land.



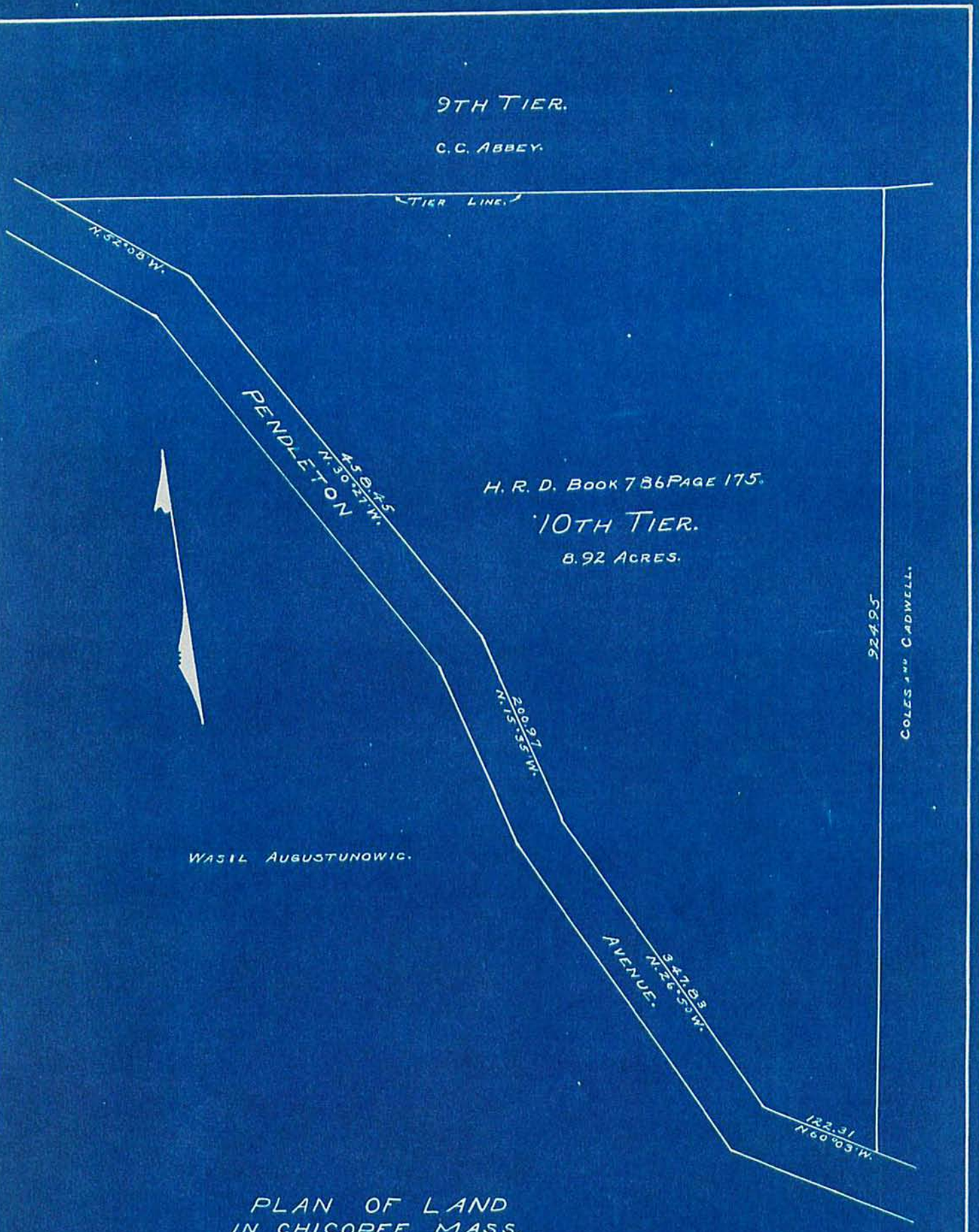
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
PERET,
CHICOPEE, MASS.

SCALE :- 1 IN. = 80 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Peret to City of Chicopee.

Beginning on the Southerly line of the 8th tier at a point about 528.0 feet Easterly of the North West corner of lot No. 223 in the 9th tier owned by Henry A. Munsing, and running thence North 33° 59' East, 360.13 feet to a point; thence North 88° 5' East, about 446.0 feet to land of Cowles & Cadwell; thence Southerly by land of said Cowles & Cadwell and land of owner unknown, to a point on the Southerly line of the said 8th tier; thence Westerly by the Southerly line of said 8th tier to point of beginning. Containing about 3.70 acres of land.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

WASIL AUGUSTUNOWIC,

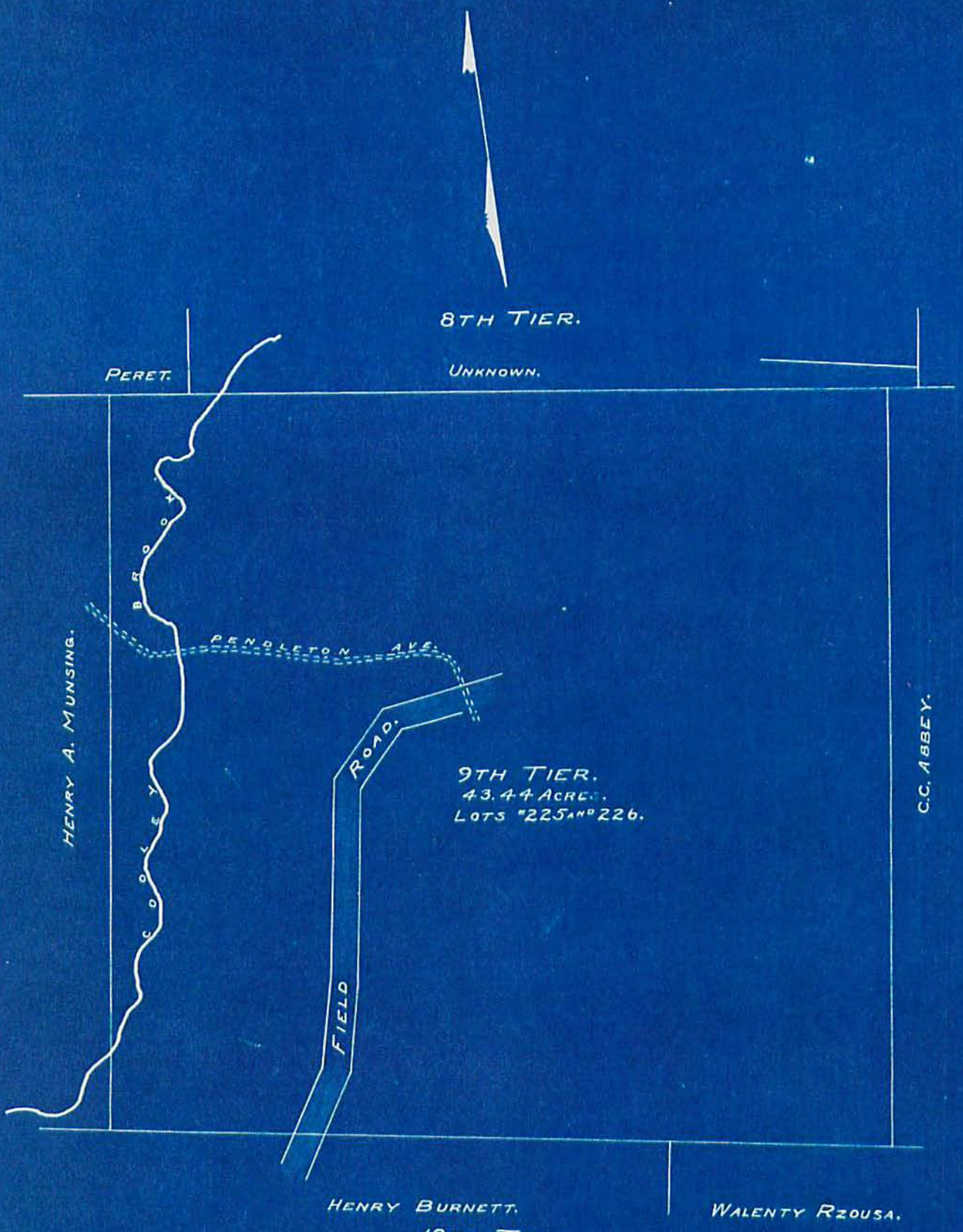
CHICOPEE, MASS.

SCALE:- 1 IN. = 100 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Wasil Augustunowic to City of Chicopee.

Beginning at a stake and stone on the Northerly side of Pendleton Avenue at land of Cowles & Cadwell, and being in the 10th tier of lots and running thence North 60° 3' West 122.31 feet; thence North 26° 50' West, 347.83 feet to a point; thence North 15° 35' West, 200.97 feet to a point; thence North 30° 27' West, 458.45 feet to a point; thence North 52° 8' West to the inner section of the line between the 9th and 10th tiers. The last five courses being the Northerly line of said Pendleton Avenue at land thought to be owned by C. C. Abbey; thence Easterly along said tier line to corner of land owned by Cowles & Cadwell aforesaid; thence Southerly by land of said Cowles & Cadwell, 924.95 feet to point of beginning. Containing about 8.92 acres, and being part of land conveyed to said Wasil Augustunowic by deed H.R.D., book 786, page 175.



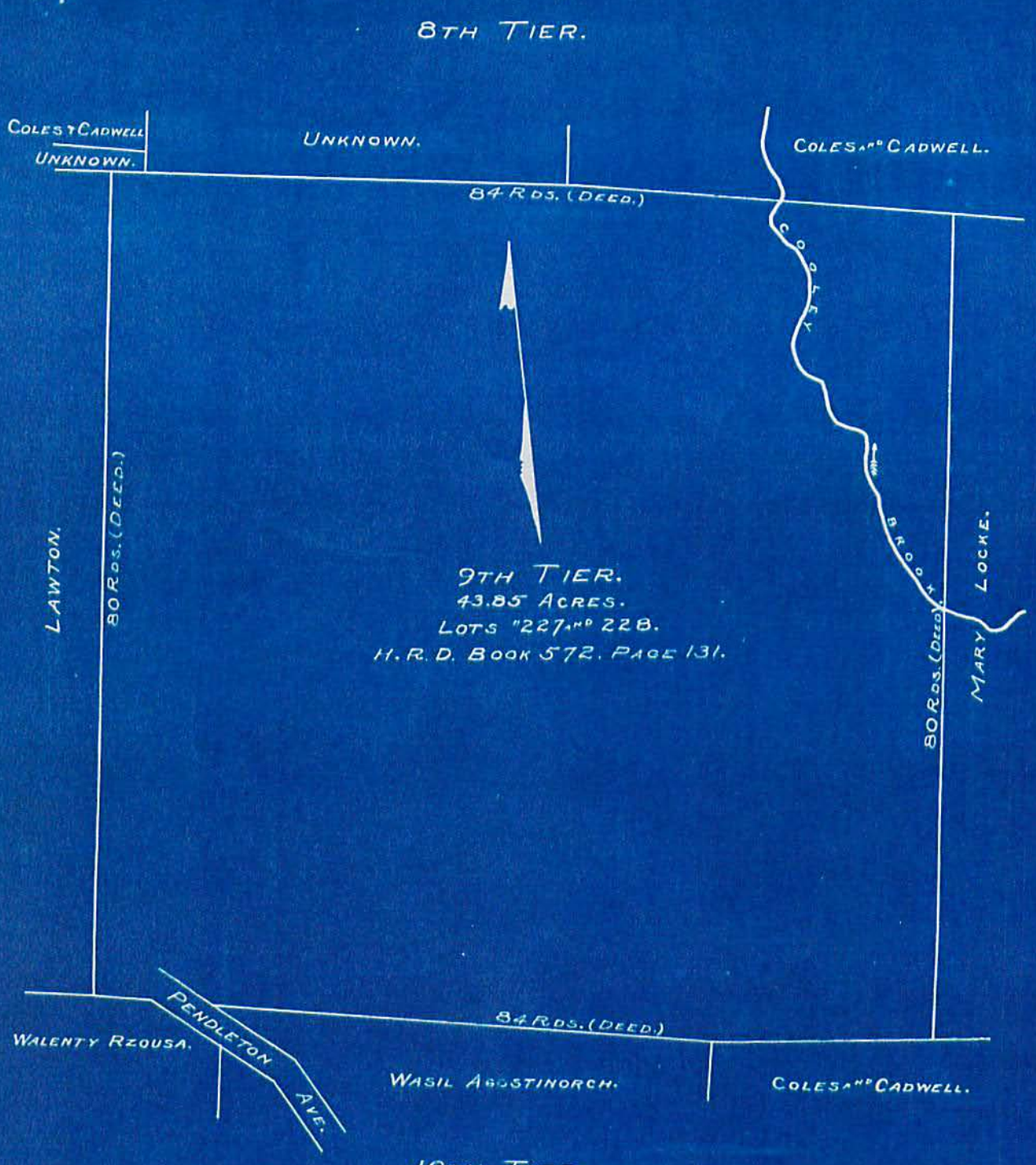
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
LAWTON,

SCALE: 1 IN. = 200 FT. JUNE - 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Lawton to City of Chicopee.

Beginning on the Southerly line of the 9th tier at the South East corner of Henry A. Munsing's lot, #224, and running thence Northerly by said Munsing's land across Cooley Brook and thence across Pendleton Avenue to the Northerly line of said 9th tier at land of one Peret, also being the North East corner of said Munsing's lot #224; thence Easterly along the Northerly line of said 9th tier crossing Cooley Brook to a corner thought to be the North West corner of land owned by C. C. Abbey, and being lot #227; thence Southerly by said Abbey's land to the Southerly line of the 9th tier aforesaid; thence Westerly by said Southerly line of 9th tier crossing an old wood road to point of beginning. Containing about 43.44 acres and being lots No.225 and 226.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
C. C. ABBEY,
CHICOPEE, MASS.

SCALE: 1 IN. = 200 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, SPRINGFIELD, MASS.

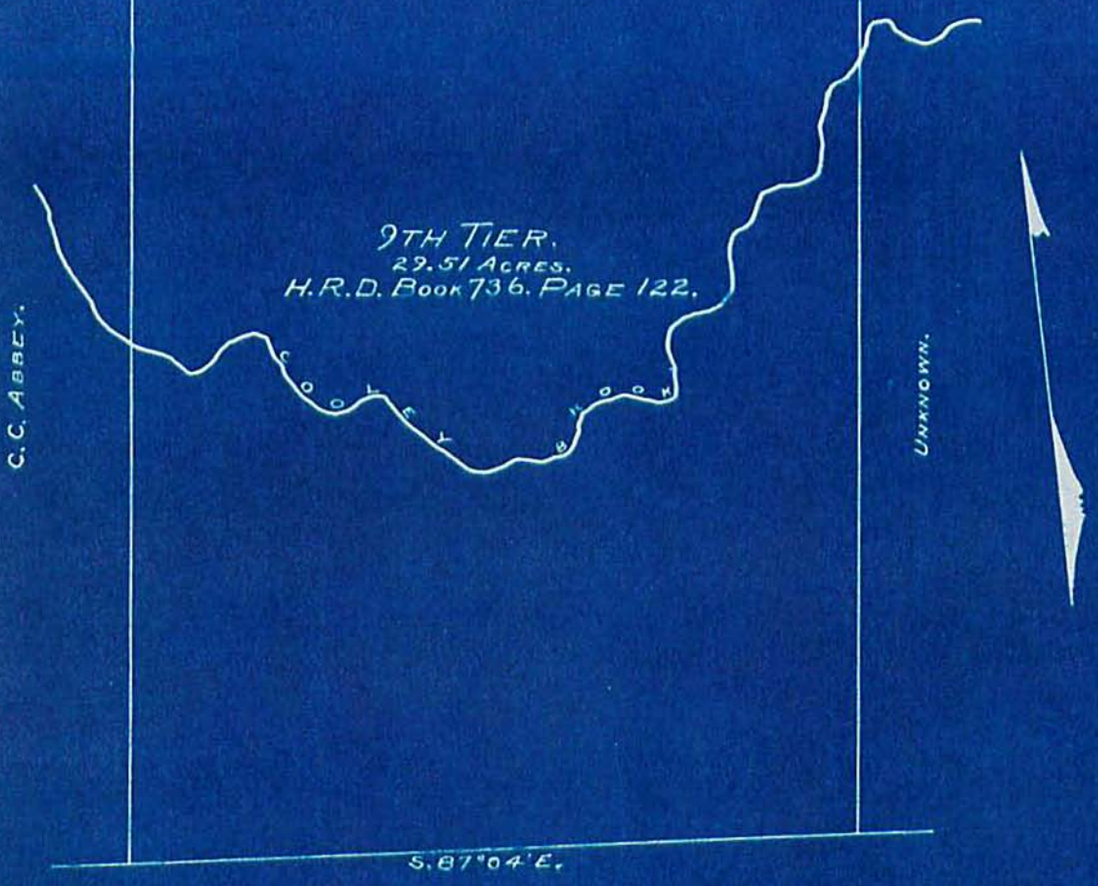
C. C. Abbey to City of Chicopee.

Beginning at the South West corner of the lot herein conveyed on the tier line; thence running East on the tier line 84 rods, more or less, to land now or formerly of N. B. Paulk; thence North 80 rods to the tier line; thence West 84 rods, more or less, to land formerly of C. W. Chapin, et al; thence South parallel with the East line to the place of beginning, containing 42 acres, more or less, being land conveyed to C. C. Abbey by Matthew Ryan by deed H.R.D., book 572, page 131.

8TH TIER.

COLES AND CADWELL.

N 79°-52'-30" W.



S. 87°-04' E.

COLES AND CADWELL.

10TH TIER.

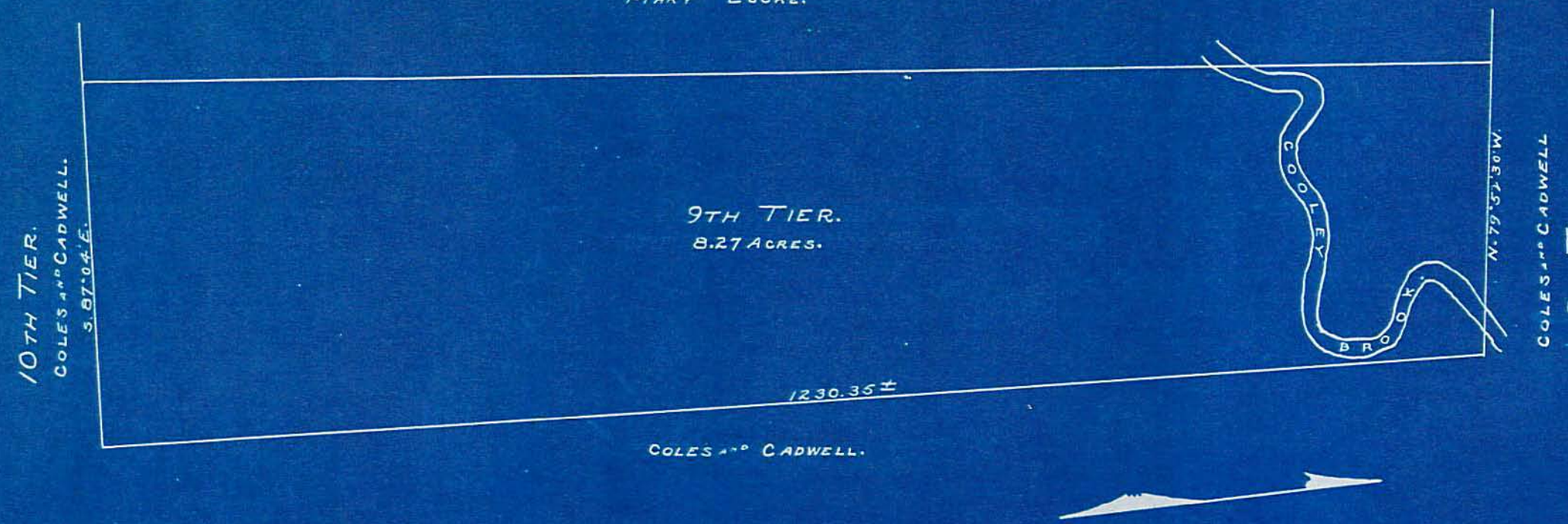
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
MARY A. LOCKE,
CHICOPEE, MASS.

SCALE:- 1 IN. = 200 FT. JUNE-1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Mary A. Locke to City of Chicopee.

A certain lot of wood land in said Chicopee containing 30 acres, more or less, at Spruce Swamp, so called, bounded Easterly and Southerly by land of one Paulk, Westerly by land of Charles C. Abbey, Northerly by land of owner unknown, being a part of the premises set off to Abigail Chapin in a division of the estate of Zerah Chapin, and therein described as 30 acres of land at Spruce Swamp, beginning at the North West corner of lot No.329 (of the inward commons of Springfield) measuring Easterly 60 rods, Southerly 80 rods, Westerly 60 rods, Northerly 80 rods. The above description being taken from deed to Mary A. Locke from Theadore L. Chapin and being registered H.R.D., book 736, page 122.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

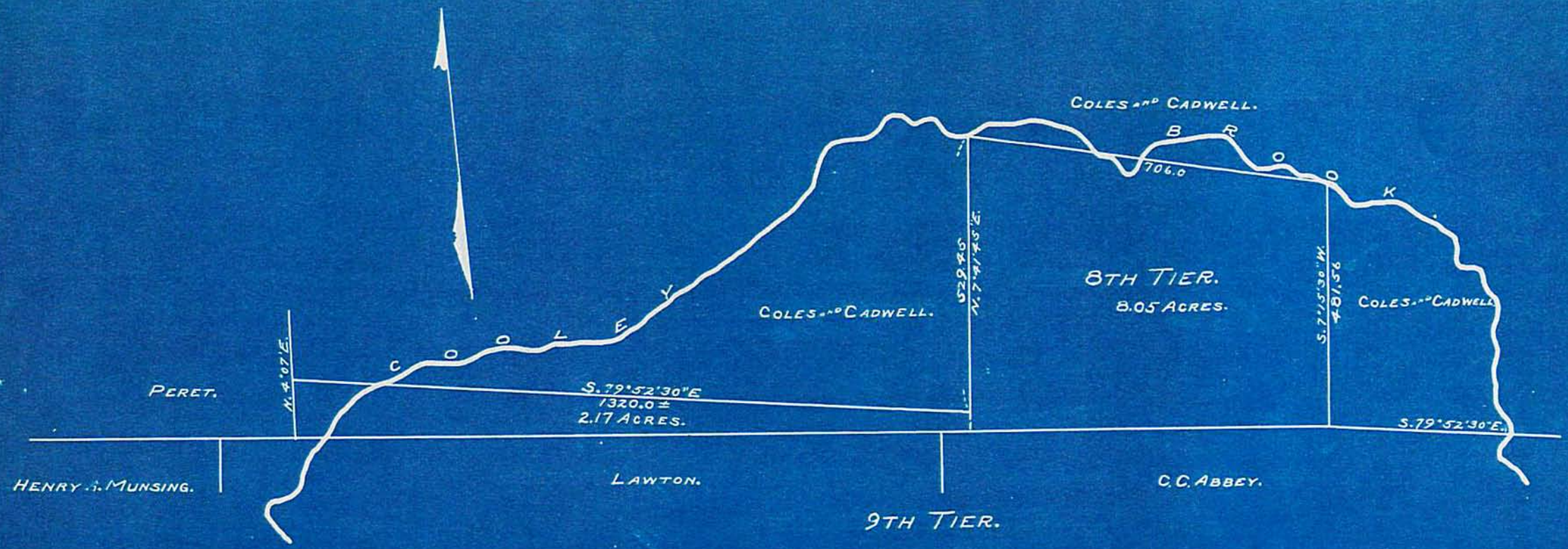
UNKNOWN.

SCALE:- 1 IN. = 100 FT. JUNE, 1914.

COBB, BEESLEY AND MILES, CIV. ENGRS. SPRINGFIELD, MASS.

Unknown to City of Chicopee.

Beginning at a point in the Southerly line of the 9th tier at a corner thought to be the South East corner of land owned by Mary Locke as per H.R.D., book 114, page 138, describing lot #229, and running thence Northerly by the Easterly line of said Mary Locke's land, crossing Cooley Brook to the Northerly line of the 9th tier at land of Cowles & Cadwell; thence South 79° 52' 30" East, again crossing Cooley Brook to a corner of land owned by Cowles & Cadwell; thence Southerly by land of said Cowles & Cadwell, about 1230.35 feet to a corner; thence North 87° 4 ' West by land of said Cowles & Cadwell, and being the Southerly line of the 9th tier aforesaid to point of beginning. Containing about 8.27 acres of land.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

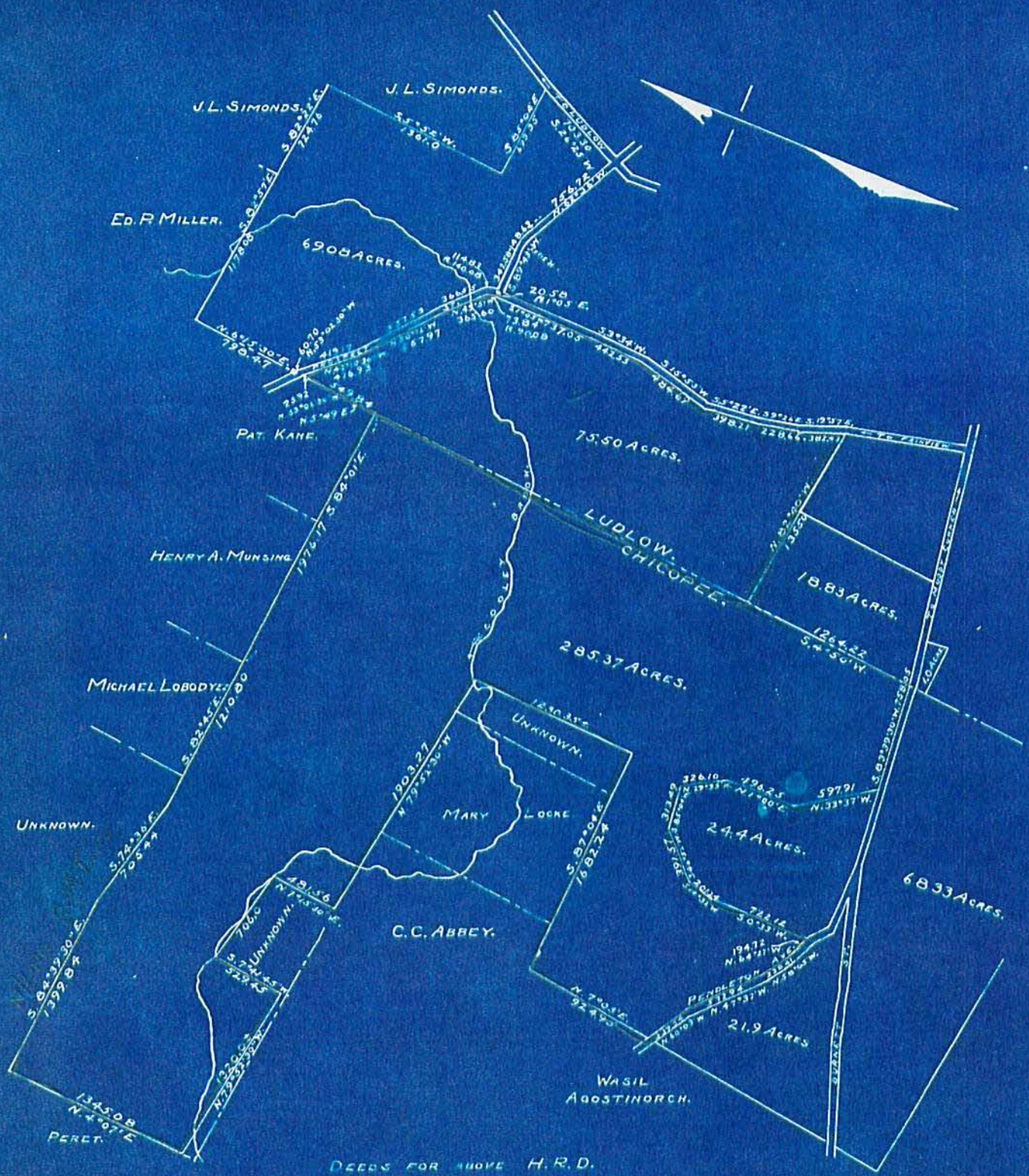
UNKNOWN

SCALE:- 1 IN. = 200 FT. JUNE-1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS SPRINGFIELD, MASS.

Unknown to City of Chicopee.

Beginning at the South Easterly corner of land owned by one Peret on the Southerly line of the 8th tier near Cooley Brook; and running thence North 4° 7' East to the South West corner of land owned by Cowles & Cadwell inthe 8th tier; thence running South 79° 52' 30" East, crossing Cooley Brook about 1320.0 feet to a point; thence running North 7° 41' 45" East, 529.45 feet to a point in or near Cooley Brook; thence running Easterly in a straight line along Cooley Brook, 706.0 feet to a point in or near said Cooley Brook; thence South 7° 15' 30" West, 481.56 feet. The last four courses being by land of said Cowles & Cadwell; thence Westerly along the Southerly line of the 8th tier aforesaid by land thought to be owned by C. C. Abbey and one Lawton, again crossing Cooley Brook to point of beginning. Containing about 10.22 acres of land.



DEEDS FOR ABOVE H.R.D.

BOOK.	PAGE.	ACRES.
765	313	430.5
786	423	40.
784	78	40.
836	211	41.
794	86	42.
	TOTAL	303.5

PLAN OF LAND IN CHICOPEE AND LUDLOW, MASS.

OWNED BY

COLES AND CADWELL, AMHERST, MASS.

SCALE 1 IN. = 800 FT. JUNE, 1914.

CORB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Cowles & Cadwell to City of Chicopee.

Beginning at a stone bound on the road to Moody corner on the line between the City of Chicopee and the Town of Ludlow, and running thence South 83° 39' 30" West, 758.05 feet to a point; thence North 33° 37' West, 597.91 feet; thence North 1° East, 496.25 feet to a point; thence North 29° 35' West, 326.10 feet; thence South 85° 4' West, 313.49 feet; thence South 46° 52' West, 391.57 feet to a point; thence South 19° 32' West, 201.24 feet to a point; thence South no degrees, 33' West, 722.12 feet to the Northerly side of Pendleton Avenue. The last seven courses being by land of said Cowles & Cadwell; thence North 64° 27' West, 194.72 feet to a point; thence North 58° 5' West, 220.41 feet to a point; thence North 47° 37' West, 572.94 feet to a point; thence North 60° 3' West, 339.54 feet to a point. The last four courses being on the Northerly side of Pendleton Avenue; thence North 7° 3' East by land of Wasil Augustunowic, 924.95 feet to tier line between the 9th and 10th tiers; thence South 87° 4' East by land thought to be of C. C. Abbey, Mary Locke and party unknown, 1682.24 feet to a point, supposed to be on said tier line; thence North about 1230.35 feet to a point near Cooley Brook; thence North 79° 52' 30" West, crossing Cooley Brook by land of owner unknown and land supposed to be owned by Mary Locke and C. C. Abbey, again crossing Cooley Brook, 1903.27 feet to a point; thence North 7° 15' 30" East, 481.56 feet to a point in or near Cooley Brook; thence in a straight line Westerly by said Cooley Brook and owner unknown, about 706.0 feet to a point in or near Cooley Brook; thence South 7° 41' 45" West by land of owner unknown, 529.45 feet to a point; thence North 79° 52' 30" West, again crossing Cooley Brook about 1320.0 feet to a point; thence North 4° 7' East by land of one Peret, 1345.08 feet to a point, being on the Northerly line of the 8th tier; thence South 84° 39' 30" East, along said tier line 1399.84 feet to a point;thence South 74° 36' East, 705.44 feet to a point. The last two courses being by land of owners unknown; thence South 82° 45' East by land of owners unknown and Michael Lobodyz, 1210.80 feet to an old ground stone, marking the line between said Lobodyz and Henry A. Munsing; thence South 84° 1' East by land of said Munsing and Patrick Kane, 1976.17 feet to a point on the line between the City of Chicopee and Town of Ludlow, thence Southerly on said line between City of Chicopee and Town of Ludlow crossing Cooley Brook to point of beginning. Containing about 285.37 acres.

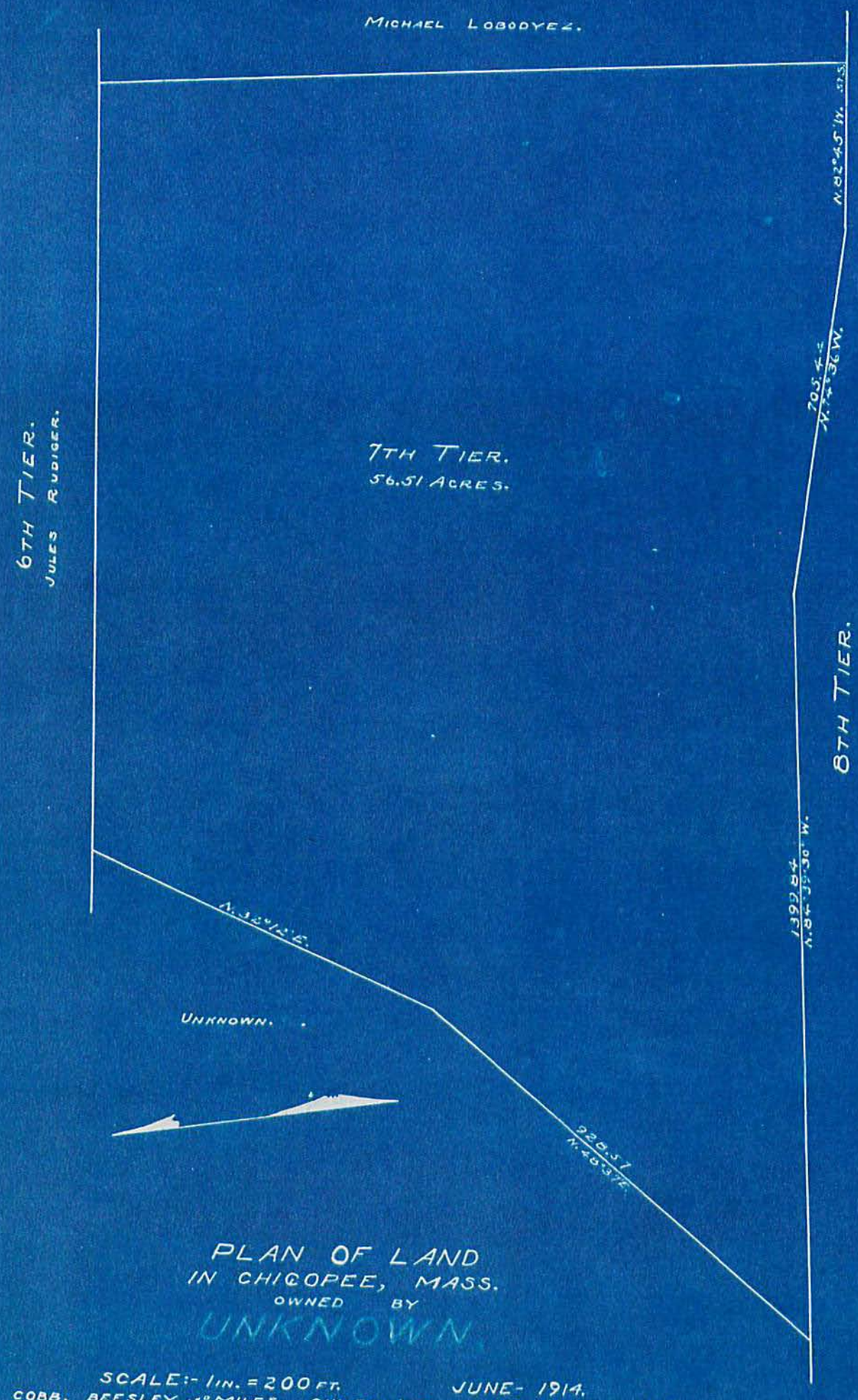
Second Parcel (In Ludlow)

Beginning on the Southerly side of Prospect Street at the intersection of said Southerly line of said street and the line between City of Chicopee and the Town of Ludlow, and running thence South 53° 2' 30" East, 25.92 feet to a point; thence South 42° 10' 30" East, 416.93 feet to a point; thence South 50° 12' East, 557.97 feet to a point; thence South 45° 51' East, crossing Cooley Brook 365.60 feet to a point; thence by a curve to the right, the radius of which is 90.08 feet, and distance on curve being 73.84 feet to a point; thence South 1° 5' West, 737.05 feet to a point; thence South 3° 34' West, 442.53 feet to a point; thence South 15° 53' West, 484.69 feet to a point; thence South 5° 22' East, 398.21 feet to a point; thence South 9° 26' East, 228.66 feet to a point; thence South 19° 57' East, 382.43 feet to a point of land of owner unknown. The last eleven courses being on the Westerly side of Prospect Street, so called; thence North 82° 40' West, about 1355.0 feet to the line between the aforesaid City of Chicopee and the Town of Ludlow; thence Northerly by said line between said City and Townm crossing Cooley Brook to the point of beginning. Containing about 75.50 acres of land.

Third Parcel (In Ludlow)

Beginning on the Northerly side of Prospect Street at a stone bound, marking the line between the City of Chicopee and the Town of Ludlow and running thence North 6° 15' 30" East on line between said City and Town 798.47 feet to a stake and stone; thence South 82° 57' East by Ed.P.Miller, crossing Cooley Brook 1178.08 feet to a stake and stone, marking the South East corner of land of said Miller; thence South 82° 22' East by land of J. Leroy Simonds, 724.76 feet to a stake and stone, marking the North West corner of other land owned by J. Leroy Simonds in the 7th tier. The last two courses being on the line between the 6th and 7th tiers; thence South 5° 52' West by land of J. Leroy Simonds, 1361.0 feet to a stake and stone, marking the South West corner of land owned by said Simonds in the 7th tier; thence South 85° 4' East, 693.35 feet to a stake and stone on the Westerly side of road leading to Ludlow; thence South 26° 25' West by the Westerly line of said road; 703.30 feet to the inner section of the road to Ludlow with the road leading to Prospect Street; thence North 62° 36' West, 756.72 feet to a point; thence by a curve to the left, the radius of which is 313.57 feet, 148.63 feet on the curve to a point; thence South 89° 43' West, 347.58 feet to a point, marking the intersection of road leading to Prospect Street and the Easterly side of Prospect Street. The last three courses being on the Northerly side of said road; thence North 1° 5' East, 20.58 feet to a point; thence by a curve to the left, the radius of which is 140.08 feet, 114.83 feet on the curve; thence North 45° degrees, 51' West, crossing Cooley Brook 366.55 feet to a point; thence North 50° 12' West, 557.53 feet to a point; thence North 42° 10' 30" West, 419.17 feet to a point; thence North 53° 2' 30" West, 60.70 feet to point of beginning.

The above three parcels being conveyed to Cowles & Cadwell by deeds H.R.D., book 765, page 515, also book 788, page 493, also book 784, page 78, also book 836, page 211, also book 794, page 86, covering 563½ acres of which above described 429.95 acres being parts thereof.



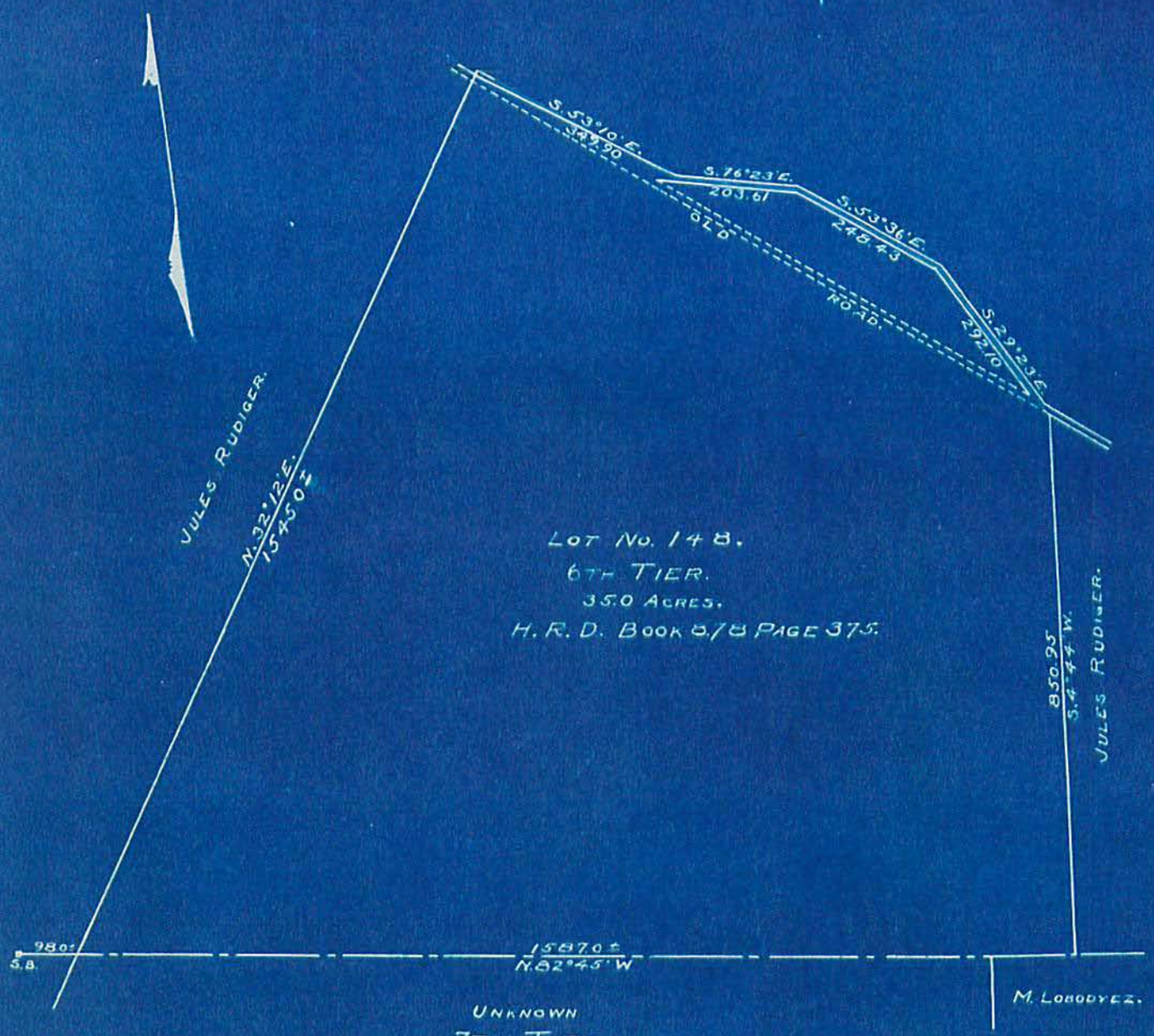
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
UNKNOWN.

SCALE:- 1 IN. = 200 FT. JUNE- 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Unknown to City of Chicopee.

Beginning at a stake and stone on a Southerly line of the 7th tier at the South West corner of land owned by Michael Lobodyz and running thence North 82° 45' West to a point; thence North 74° 36' West, 705.44 feet to a point; thence North 84°39' 30" West, 1399.84 feet to a corner. The last three courses being by land of Cowles & Cadwell, and said corner marking the North West corner of land of said Cowles & Cadwell in the 8th tier; thence North 48° 37' East, 928.57 feet to a point; thence North 32° 12' East to the Northerly line of the 7th tier, at land owned by Jules Rudiger; thence Easterly on said tier line by land of Jules Rudiger to the North West corner of land owned by Michael Lobodyz; thence Southerly by Michael Lobodyz's land to point of beginning. Containing about 56.51 acres of land.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY

JULES RUDIGER,

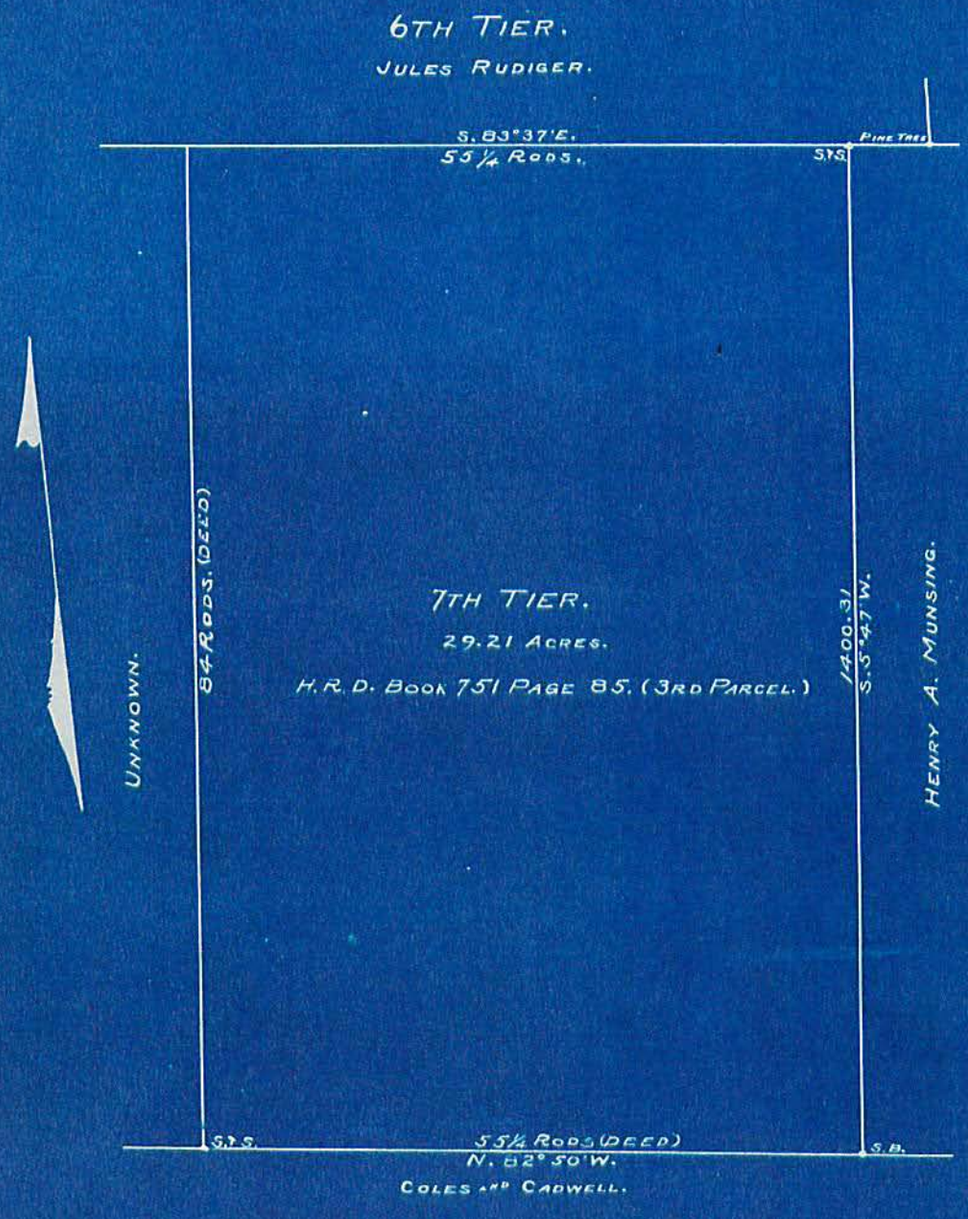
CHICOPEE, MASS.

SCALE:- 1 IN. = 200 FT. JUNE-1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS SPRINGFIELD, MASS.

Jules Rudiger to City of Chicopee.

Beginning at a point on a Southerly line of the 6th tier, about 98.0 feet Easterly of a stone bound on said tier line marking the South West corner of land of said Rudiger, and running thence North 32° 12' East, about 1545.0 feet to a point on the Northerly side of travelled road known as Prospect Street; thence South 53° 10' East, 349.90 feet to a point; thence South 76° 23' East, 203.61 feet to a point; thence South 53° 36' East, 248.43 feet to a point; thence South 29° 23' East, 292.10 feet to the Southerly side of said travelled road. The last four courses being the center of road known as Prospect Street aforesaid; thence South 4° 44' West, 850.95 feet to a point on the Southerly line of the aforesaid 6th tier. The last six courses by land of Said Rudiger; thence North 82° 45' West by land of Michael Lobodyz and owner unknown on the Southerly line of said tier, about 1587.0 feet to point of beginning. Containing about 35 acres of land, and being part of land conveyed to JulesRudiger by Monroe Keith in deed H.R.D., book 878, page 375.



PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY.

MICHAEL LOBODYEZ.

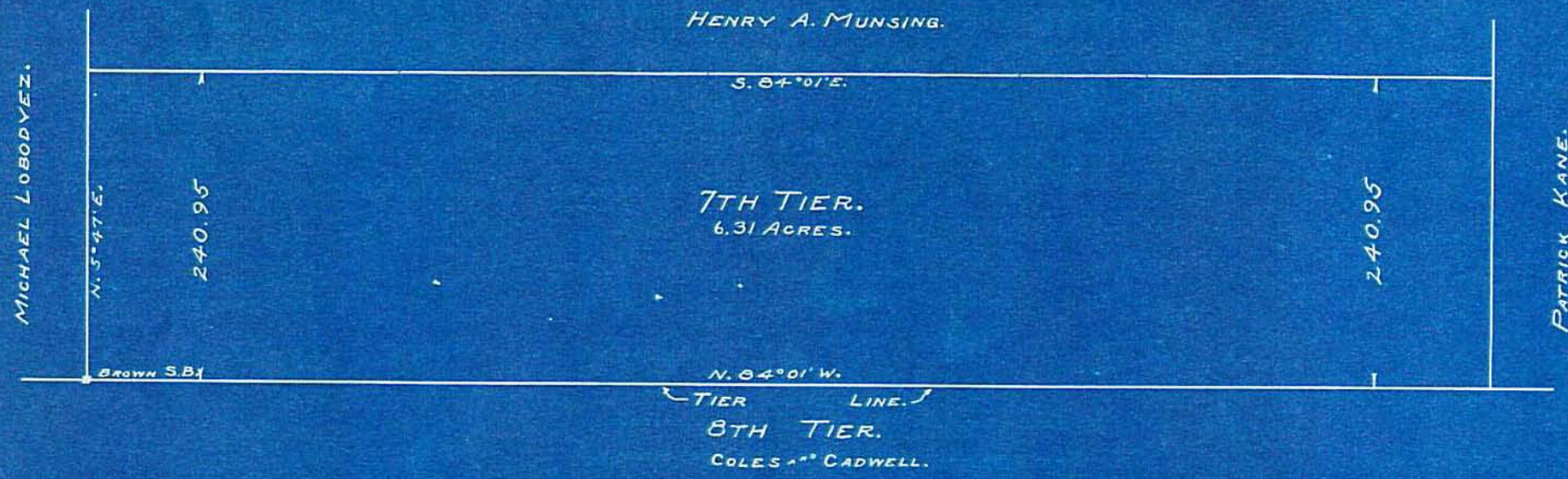
CHICOPEE, MASS.

SCALE:- 1 IN. = 200 FT. JUNE - 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Michael Lobodyez to City of Chicopee.

Beginning at a brown stone bound on the Southerly line of the 7th tier, marking the South West corner of land owned by Henry A. Munsing, and running thence North 82° 50' West on the Southerly line of said tier, by land of Cowles & Cadwell, 55¼ rods to a stake and stone; thence Northerly by land of owner unknown, about 84 rods to the Northerly line of said tier, at land of Jules Rudiger; thence South 83° 37' East, about 55¼ rods to a stake and stone on said tier line, and marking the North West corner of land owned by Henry A. Munsing; thence South 5° 47' West, 1400.31 feet to point of beginning. Containing about 29.21 acres of land, and meaning to convey land described as the third parcel in deed H.R.D.,book 751, page 85.



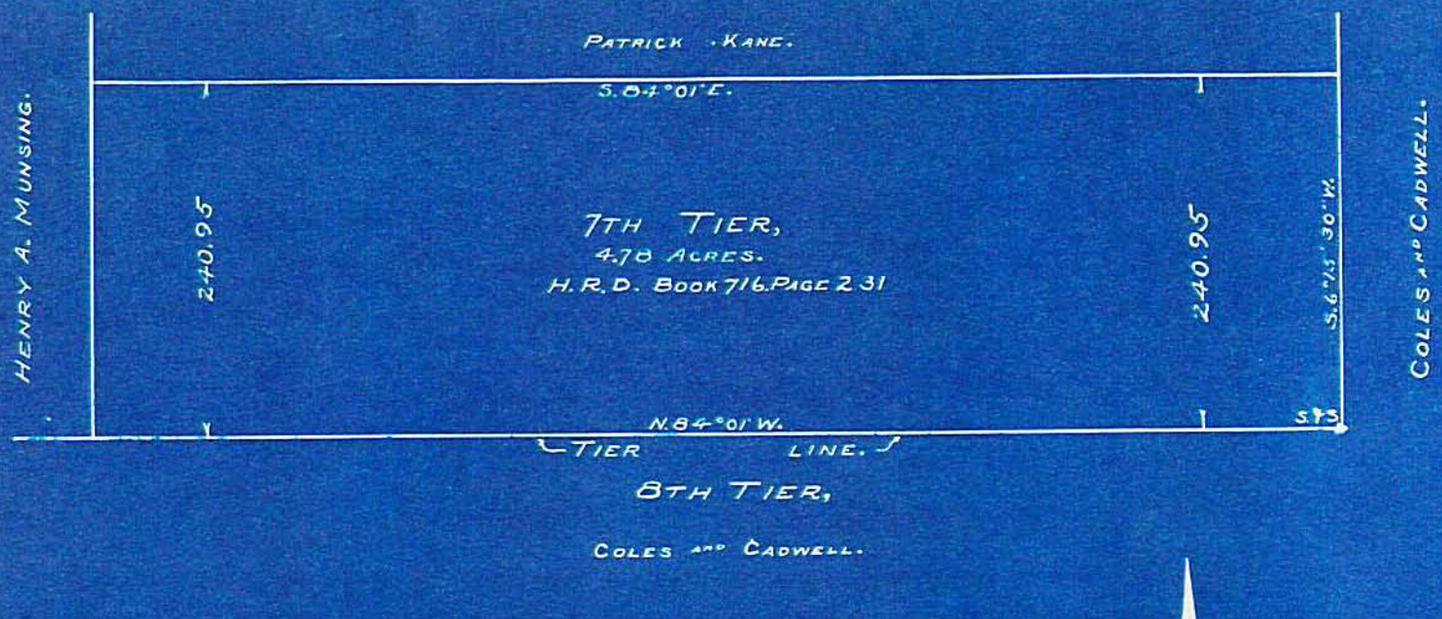
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
HENRY A. MUNSING,
LUDLOW, MASS.

SCALE: 1 IN. = 100 FT. JUNE - 1914.

COBB, BEESLEY & MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Henry A. Munsing to City of Chicopee.

Beginning at an old brown stone on the Southerly line of the 7th tier, marking the South East corner of land owned by Michael Lobodyez; and running thence North 5° 47' East, 240.95 feet to a point by land of Micheal Lobodyez; thence South 84° 1' East by land of said Munsing to land of Patrick Kane; thence Southerly by land of said Patrick Kane, 240.95 feet to a point on said tier line; thence North 84 degrees, 1' West by land of Cowles & Cadell on said tier line to point of beginning. Meaning to convey a strip 240.95 feet wide, being the Southerly part of land owned by said Munsing, and containing about 6.31 acres of land.



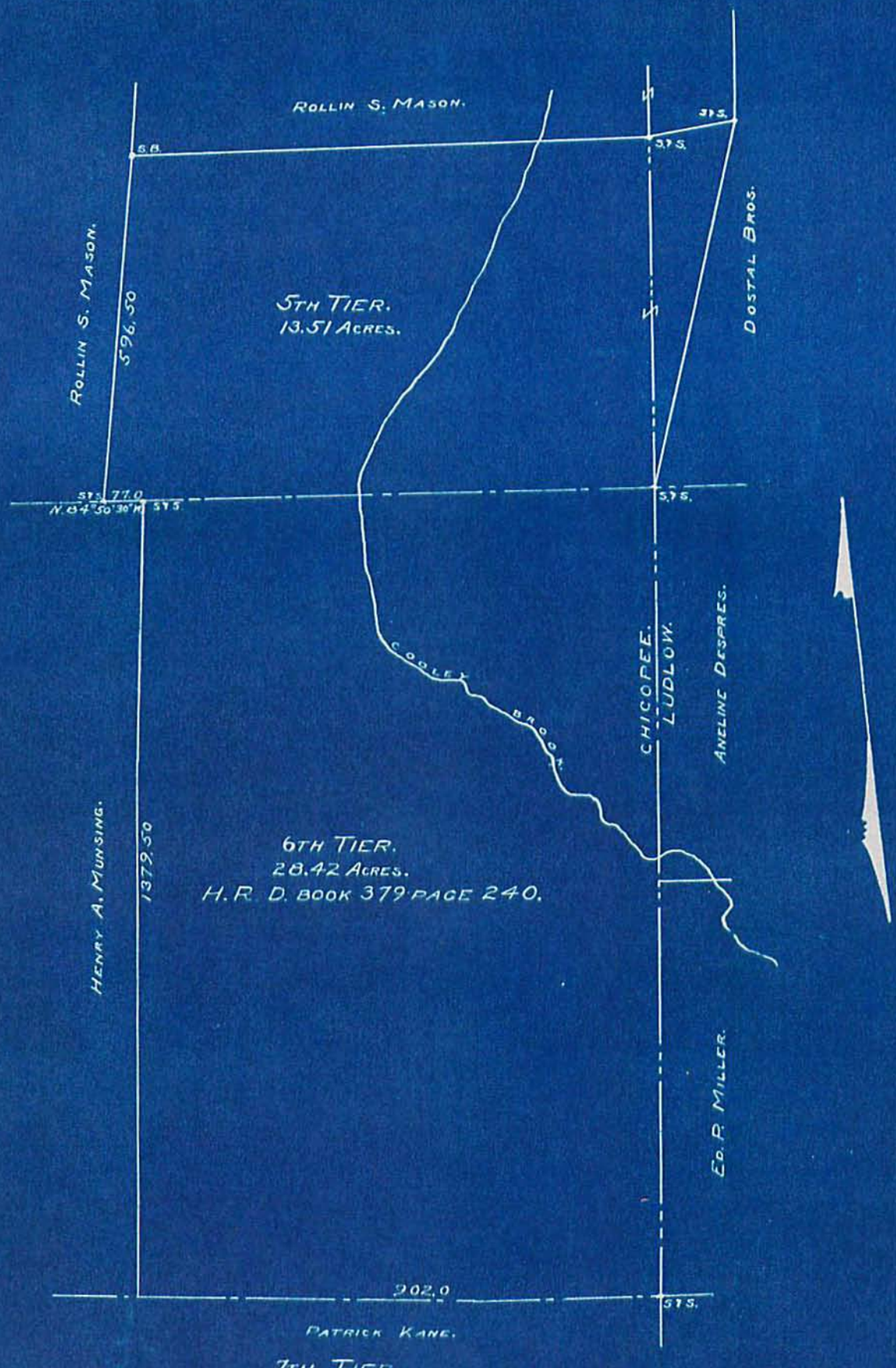
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
PATRICK KANE.

SCALE:- 1 IN. = 100 FT. JUNE - 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Patrick Kane to City of Chicopee.

Beginning at a stake and stone thought to be on the line between the City of Chicopee and the Town of Ludlow, and marking the South East corner of land conveyed to Patrick Kane in deed H.R.D., book 716, page 231; and running thence North 84° 1' West by land of Cowles & Cadwell to land owned by Henry A. Munsing; and running thence Northerly by land of said Munsing 240.95 feet to a point; thence South 84° 1' East by land of said Patrick Kane to said City line; thence South about 6° 15' 30" West, 240.95 feet to point of beginning, meaning to convey a strip 240.95 feet the entire width at the Southerly side of land of said Patrick Kane, and containing about 4.78 acres of land.



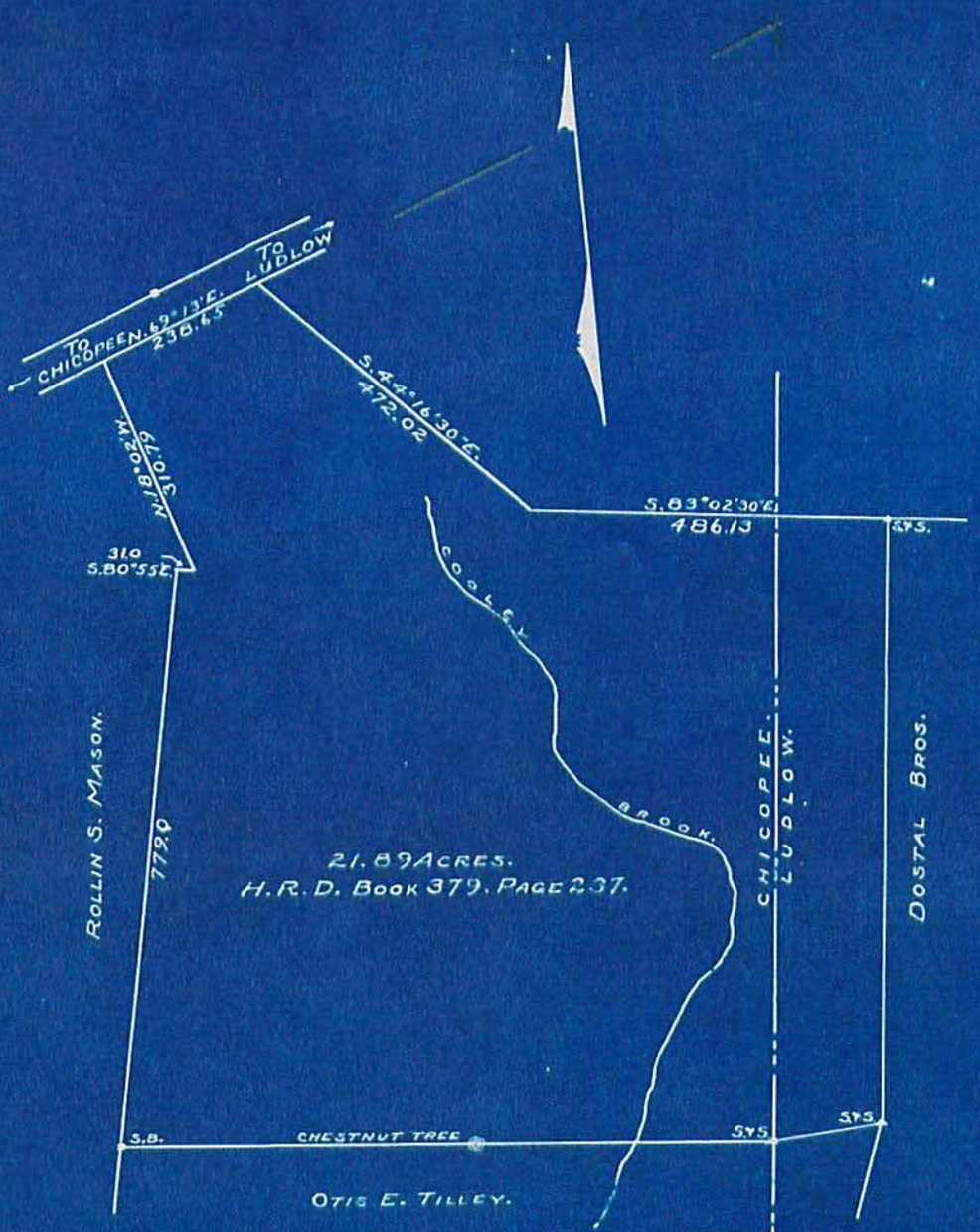
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
OTIS E. TILLEY
GRANBY, MASS.

SCALE:- 1 IN. = 200 FT. JUNE-1914.

COBB, BEESLEY & MILES, CIV. ENG'RS SPRINGFIELD, MASS.

Otis E. Tilley to City of Chicopee.

Beginning at a stake and stone on the South line of the 6th tier and marking the line between Patrick Kane, Cowles & Cadwell and Ed.P. Miller, and being the South East corner of land herein conveyed; running thence Westerly by land of Patrick Kane about 902.6 feet to land thought to be owned by Henry A. Munsing;thence North by said Munsing's land about 1379.50 feet to a stake and stone on the Northerly line of the 6th tier aforesaid; thence Westerly on said tier line about 77.0 feet to a point; thence Northerly about 596½ feet to a stone bound at land of Rollin S. Mason; thence Easterly by land of said Mason, crossing Cooley Brook to a stake and stone, thought to be on the line between the City of Chicopee and the Town of Ludlow; thence Easterly to a stake and stone at land of Dostal Bros.;thence Southerly by land of said Dostal Bros. to a stake and stone on the Northerly line of said 6th tier, the same marking the North West corner of land owned by Angeline Despres, and being on the City line aforesaid; thence Southerly on said City line by land of said Despres crossing Cooley Brook and continuing in same line by land of said Miller to point of beginning, being land conveyed to said Otis E. Tilley by deed H.R.D., book 379, page 240. Containing about 28.42 acres of land in the 6th tier and about 13.51 acres of land in the 5th tier, making a total of about 41.93 acres herein conveyed.



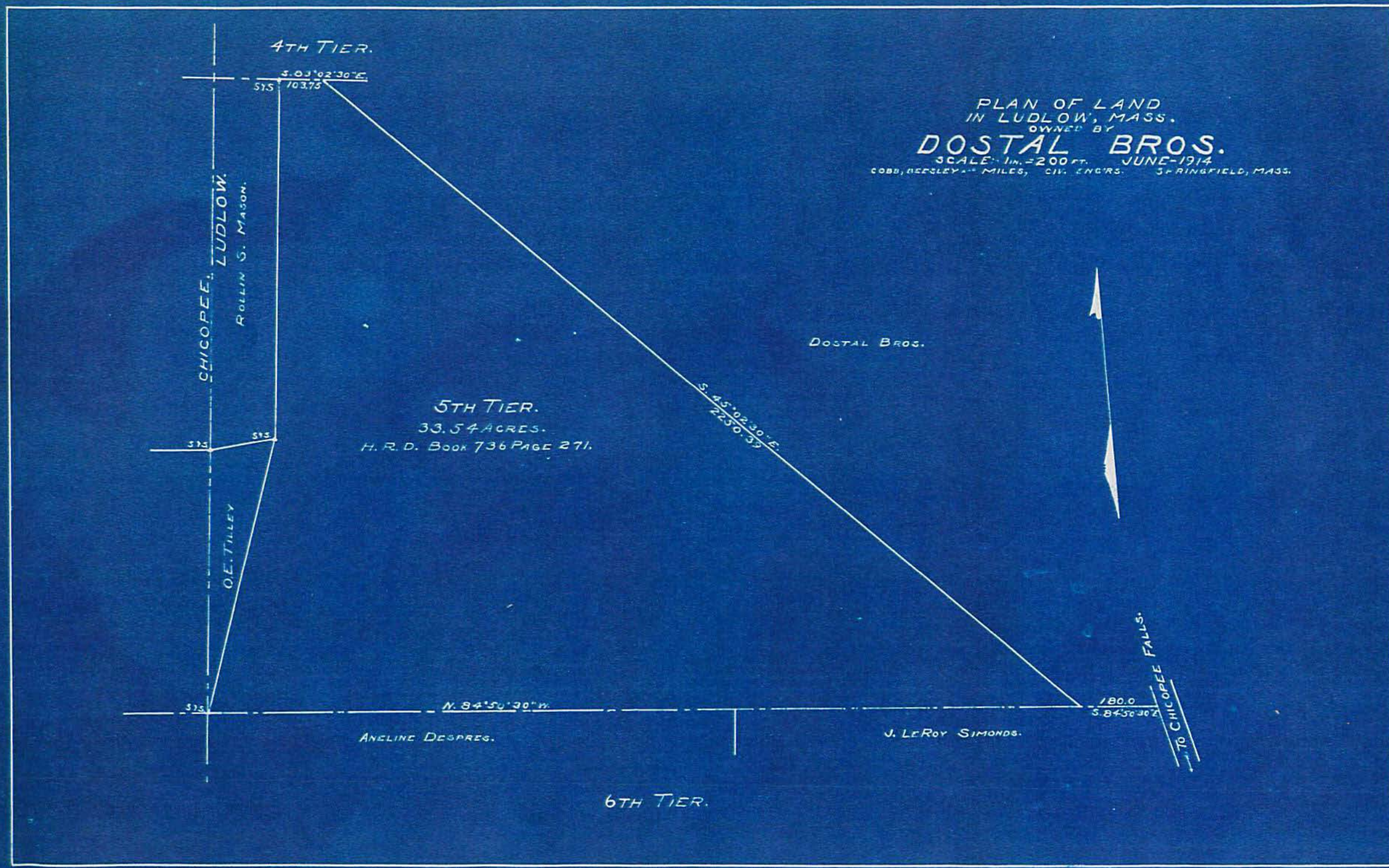
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
ROLLIN S. MASON,
CHICOPEE, MASS.

SCALE:- 1 IN. = 200 FT. JUNE-1914

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

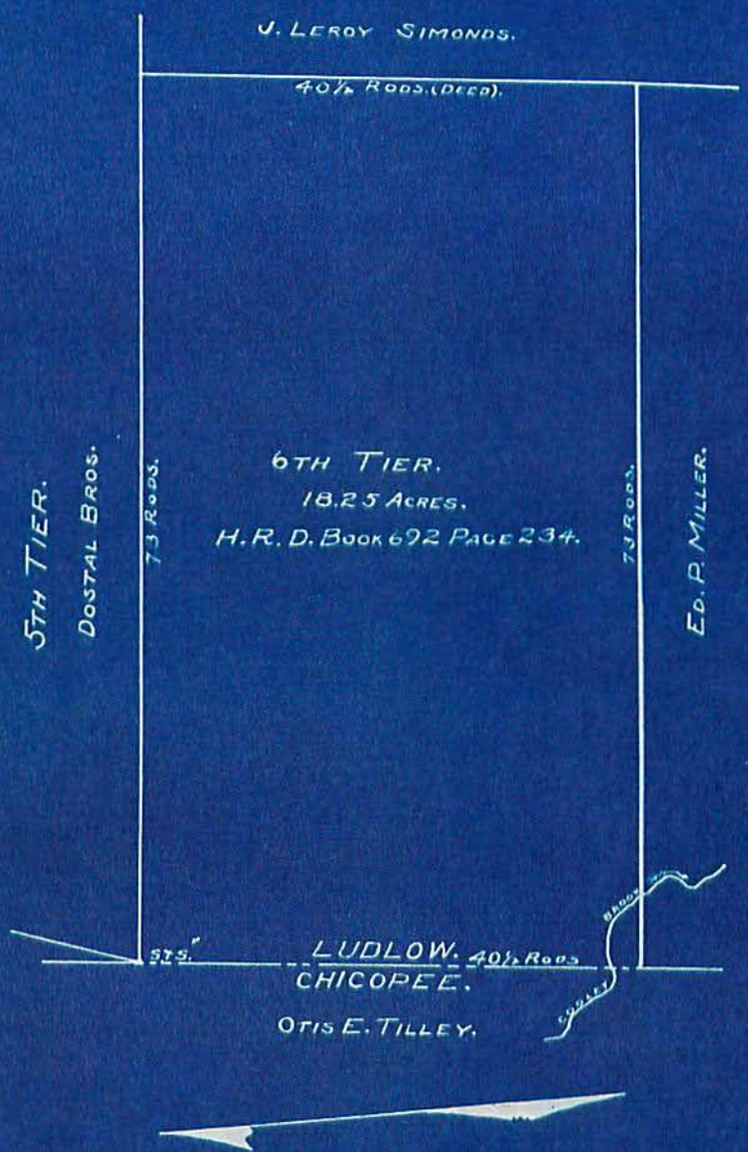
Rollin S. Mason to City of Chicopee.

Beginning on the Southerly side of road leading to Chicopee Falls from Ludlow at a point near Cooley Brook and running thence South 44° 16' 30" East, 472.02 feet to a point; thence South 83° 2' 30" East, crossing the line between the City of Chicopee and Town of Ludlow, 486.13 feet to a stake and stone; thence Southerly by land of Dostal Bros. to a stake and stone marking the North East corner of land owned by Otis E. Tilley; thence Westerly by land of said Tilley to a stake and stone, thought to be on said City line; thence Westerly by land of said Tilley crossing Cooley Brook to a stone bound, marking the North West corner of said Tilley land; thence North about 779.0 feet by land of said Mason to a point; thence South 80° 55' 30" East, about 31 feet to a point; thence North 18° 2' West by land of said Mason, 310.79 feet to a point on the Southerly line of said road; thence North 69° 13' East by the Southerly line of said road, crossing Cooley Brook 238.65 feet to point of beginning. Containing about 21.89 acres of land, and being in the 5th tier of lots and meaning to convey part of land conveyed to said Mason by deed H.R.D.,book 379, page 237.


4TH TIER.
S. 03° 02' 30" E.
103.75
S1S
CHICOPEE & LUDLOW.
ROLLIN S. MASON.
O.E. TILLEY
S1S
S1S
S1S
5TH TIER.
33.54 ACRES.
H. R. D. BOOK 736 PAGE 271.
S. 45° 02' 30" E.
2250.33
DOSTAL BROS.
PLAN OF LAND
IN LUDLOW, MASS.
OWNED BY
DOSTAL BROS.
SCALE 1 IN. = 200 FT. JUNE-1914
COBB, BEESLEY & MILES, CIV. ENG'RS. SPRINGFIELD, MASS.
N. 84° 50' 30" W.
180.0
S. 84° 50' 30" E.
TO CHICOPEE FALLS.
ANGELINE DESPRES.
J. LEROY SIMONDS.
6TH TIER.

Dostal Bros. to City of Chicopee.

Beginning at a point about 180.0 feet Westerlyfrom the Westerly side of the road leading to Ludlow from Moody corner and being on the Southerly line of the 5th tier, the bearing of which is about North 84° 50' 30" West by land of J. Leroy Simonds and Angeline Despres, to a stake and stone marking the North West corner of land of Angeline Despres and being on the line between the City of Chicopee and the Town of Ludlow, and running thence North Easterly by land of Otis E. Tilley to a stake and stone; thence Northerly by land of Rollin S. Mason to a stake and stone on the North line of the 5th tier; thence South 83° 2' 30" East, 103.75 feet to a point; thence South 45° 2' 30" East by land of grantors, 2250.39 feet to point of beginning, containing about 33.54 acres of land and meaning to convey a part of land conveyed to said grantors by deed H.R.D.,book 736, page 271.



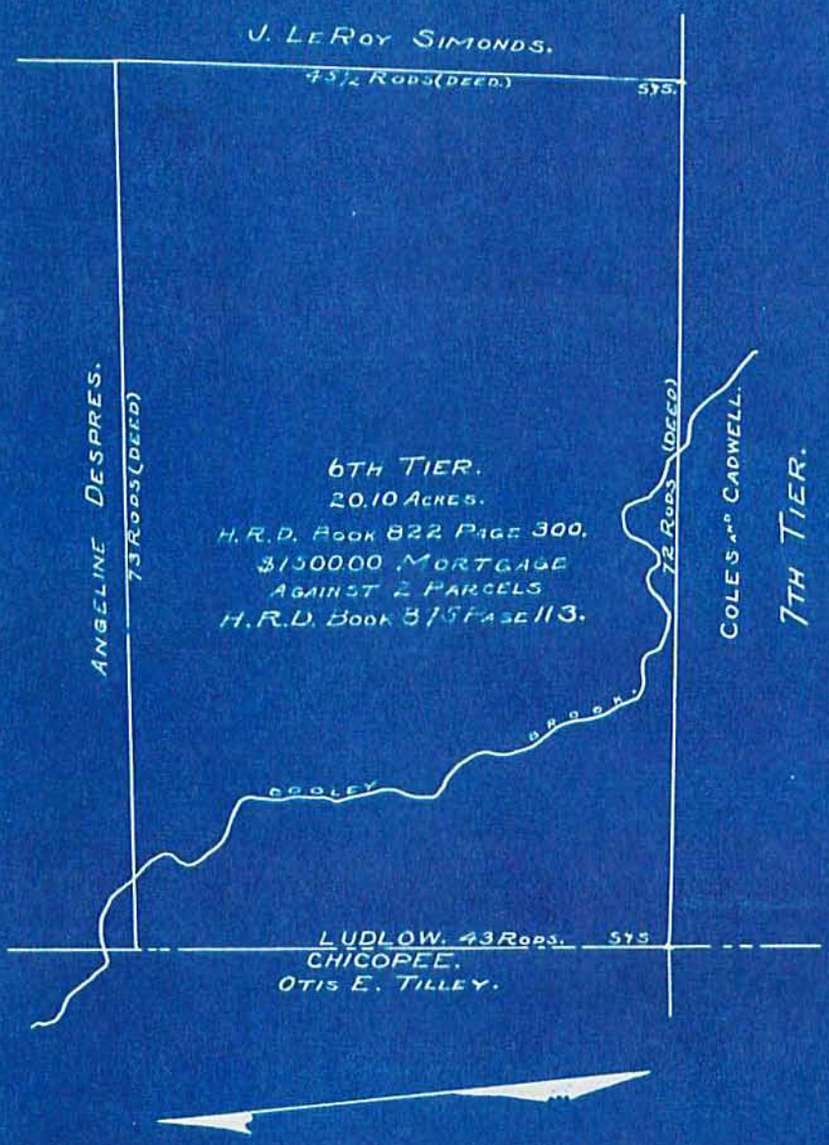
PLAN OF LAND
IN LUDLOW, MASS.
OWNED BY
ANGELINE DESPRES.

SCALE:- 1 IN. = 200 FT. JUNE - 1914.

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Angeline Despres to City of Chicopee.

Beginning at a stake and stone on the line between the City of Chicopee and the Town of Ludlow on the Northerly line of the 6th tier and marking the South West corner of land of Dostal Bros. and running thence Easterly by land of Dostal Bros. on said tier line about 73 rods to land of J. Leroy Simonds; thence Southerly by land of said Simonds about 40½ rods to land of Ed.P.Miller; thence Westerly by land of said Miller about 73 rods crossing Cooley Brook to said City line at land of Otis E. Tilley; thence Northerly again crossing Cooley Brook on said City line and by land of Otis E. Tilley about 40½ rods to point of beginning. Containing about 18.25 acres of land, and being land conveyed to Angeline Despres by deed H.R.D., book 692, page 234.



PLAN OF LAND IN LUDLOW, MASS.

OWNED BY

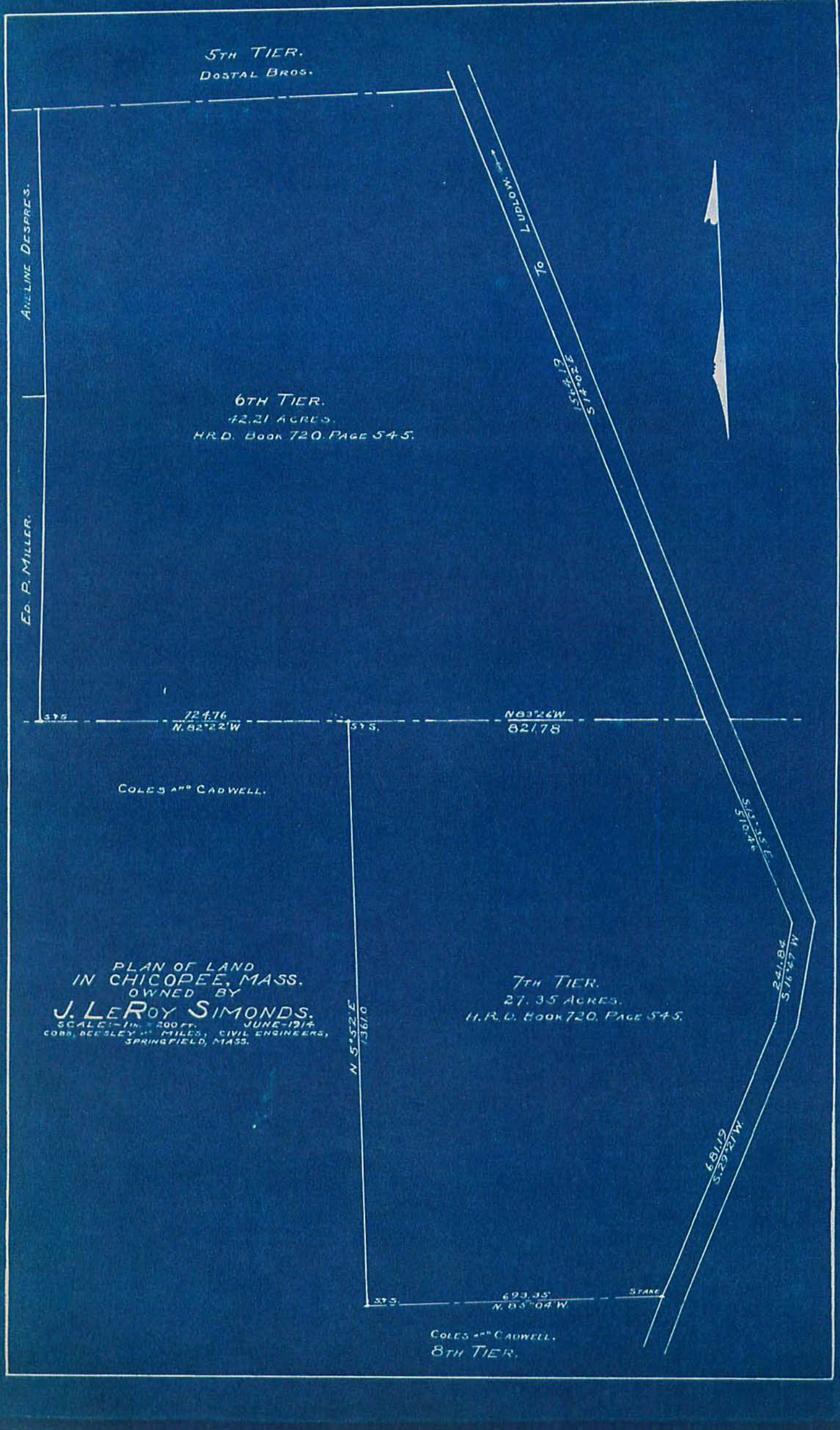
ED. P. MILLER.

SCALE: 1 IN. = 200 FT. JUNE, 1914

COBB, BEESLEY AND MILES, CIV. ENG'RS. SPRINGFIELD, MASS.

Ed. P. Miller to City of Chicopee.

Beginning at a stake and stone at the South West corner of land herein conveyed and being on the Southerly line of the 6th tier on the line between the City of Chicopee and the Town of Ludlow, and marking the corners of land of Cowles & Cadwell, Patrick Kane and Otis E. Tilley, and running thence Northerly on said City line by land of Otis E. Tilley, 43 rods to land of Angeline Despres; thence running Easterly crossing Cooley Brook by land of Angeline Despres, 73 rods to land of J. Leroy Simonds; thence Southerly by land of said Simonds about 45½ rods to stake and stone on said tier line at land of said Cowles & Cadwll; thence Westerly, again crossing Cooley Brook by land of Cowles & Cadwell about 72 rods to point of beginning. Containing about 20.10 acres of land and being premises conveyed to Ed.P. Miller by deed H.R.D., book 822, page 300.


5TH TIER.
DOSTAL BROS.
ANELINE DESPRES.
ED. P. MILLER.
TO LUDLOW
S 17° 45' E
320.41'
6TH TIER.
42.21 ACRES.
H.R.D. BOOK 720. PAGE 545.
STS.
724.76
N. 82° 22' W
STS.
N 83° 26' W
821.78
COLES AND CADWELL.
S 15° 35' E
510.4±
241.84
S. 14° 27' W
PLAN OF LAND
IN CHICOPEE, MASS.
OWNED BY
J. LEROY SIMONDS.
SCALE: 1 IN. = 200 FT. JUNE-1914
COBB, BEESLEY AND MILES, CIVIL ENGINEERS,
SPRINGFIELD, MASS.
N 5° 52' E
1361.0
7TH TIER.
27.35 ACRES.
H.R.D. BOOK 720. PAGE 545.
681.19
S. 29° 21' W.
STS.
693.35'
N. 85° 04' W.
STAKE
COLES AND CADWELL.
8TH TIER.

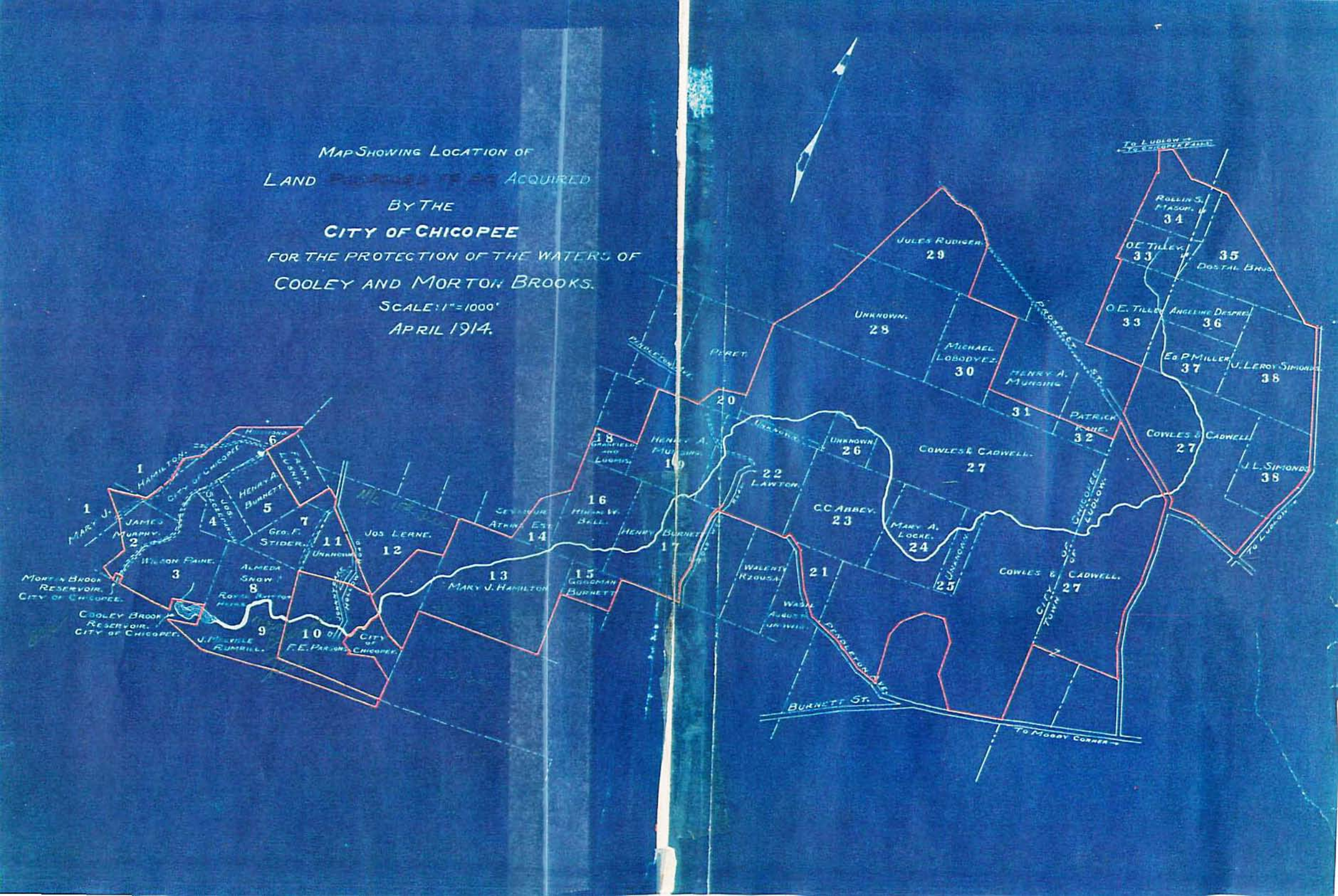
J. Leroy Simonds to City of Chicopee.

Beginning at a stake and stone on the Westerly side of road leading from Moody corner to Ludlow at the North East corner of land owned by Cowles & Cadwell in the 8th tier and being on the North line of said tier and running thence North 85° 4' West by land of said Cowles & Cadwell, 693.35 feet to a stake and stone; thence North 5° 52' East by land of said Cowles & Cadwell, 1361. feet to a stake and stone on the Northerly line of the 7th tier, thence running North 82° 22' West on said tier line by land of said Cowles & Cadwell, 724.76 feet to stake and stone at the South Easterly corner of land owned by Ed.P.Miller; thence Northerly by land of Ed.P. Miller to land of Angeline Despres, continuing Northerly by land of Angeline Despres to the Northerly line of the 6th tier at land owned by Dostal Bros.,thence about South 84° 50' 30" East on said Northerly line of the 6th tier to the Westerly side of said road; thence South 14° 2' East, 1564.19 feet to the Southerly line of said 6th tier; thence South 15° 35' East, 510.46 feet to a point; thence South 16° 47' West, 241.84 feet to a point; thence South 29° 21' West, 681.19 feet to point of beginning. The last four courses being on the Westerly side of said road, being part of the premises conveyed in H.R.D.,book 720. page 545, to J. Leroy Simonds. Containing about 42.21 acres in the 6th tier, and about 27.35 acres in the 7th tier, making a total of about 69.56 acres.

Map Showing Location of Land Proposed to be Acquired By The City of Chicopee For the Protection of the Waters of Cooley and Morton Brooks.

Scale: 1" = 1000'

April 1914.



Chicopee Dam Inspections - 1960 - 1964



1960 Reports

Inspections by Tighe & Bond.

City/Town	Chicopee
Dam	Slate Dam
Dam	Roberts Pond Dam
Dam	Hampden Brewing Company Dam
Dam	Wyszatycki Dams
Dam	Veterans of Foreign War Dam
Dam	Bemis Pond Dams
Dam	Stevens Arms Company Dam
Dam	Willimansett Brook Dam
Dam	Chicopee City Electric Light Dam
Dam	Dwight Dam
Dam	Messer Dam
Dam	Fortier Dam
Dam	Chicopee City Water Dams
Dam	Oxford Country Club Dams
Dam	Prosser Dams
Dam	Fairview Fish & Game Club Dams
Dam	Massachusetts Comm Natural Resources

Dam	Chicopee City Dam
Dam	Langwald Dam
Dam	Trout Pond Dam

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Chicopee
Nov. 29, 1960

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

Inspections recently completed of the various dams situated within the City of Chicopee have now finished the inspection routine in that community and all dams located in Chicopee have been examined one or more times during the year 1960. The following is a report on the condition of the various dams situated in Chicopee.

A. Fairview Fish & Game Club Dams

1. Willimansett Brook Dam This dam is still in the same condition as reported in recent years. The structure is breached and the opening thru the dam is wide enough to pass flood flows without ponding water. The entire pond area is rapidly being overgrown with young trees and miscellaneous vegetation. The site of the dam will be inspected annually to be certain that no one closes the breach in the dam and thus cause formation of a pond.

2. Trout Pond Dam The screen at the overflow pipe has been removed and water freely enters the shaft. When last inspected the pond was found to be at normal level. The embankment was in satisfactory condition. It is a sandy embankment but it is fairly massive for the height involved.

   The structure does not come under County jurisdiction since it is small in size and the drainage area is negligible. However, the dam is a borderline case and is checked annually to be certain that the embankment is not raised and the quantity of water in storage is not increased. Any increase in the size of the pond could result in the quantity of water stored being in excess of one million gallons and then the structure would come under County jurisdiction.

Wald Dam

dam is still breached and no pond is formed. The ch is wide and deep. The pond area is now wooded and doubtful if anyone would ever try to reactivate this

C. Roberts Pond Dam

The spillway approach channel should be cleaned of all deposits and properly shaped. All obstructures to the flow of water in the channel should be removed. Overhanging trees should be cut and trimmed.

The spillway chute is undermined at the foundation adjacent to the top left side of the masonry. This undermining should be corrected immediately and proper repairs made to protect the foundation. Riprap and grouted stone at the end of the spillway chute is undermined and repairs are needed. The riprap at the end of the chute should be improved, enlarged and extended.

The dam embankment should be brushed and cleared of large trees. The embankment face should be loamed and the loam properly fertilized and seeded to result in the formation of a good thick growth of sod.

When last inspected the pond was found to be about 3-inches below the level of the spillway crest. The drawdown gate was found to be open a few inches and flow of the brook into the pond was about equal to the quantity of water released by the slightly opened drawdown gate.

The pond should be drawn down slowly and, once emptied, the gate should be left open about one-half until such time as the dam embankment, the spillway channel and the spillway chute are properly repaired.

D. Hampden Brewing Company Dam

This dam was found to be in satisfactory condition. The stone masonry at the abutments and at the spillway itself has many open joints. However, the stones themselves are well aligned and well bedded. Consequently, conditions as now existing are satisfactory. When the open joints are in need of concreting, recommendations in connection therewith will then be made.

E. Wyszatycki Dams

1. Upper Dam This structure was purposely breached some years ago. The breach still exists and is sufficiently wide and deep to pass flood flows without ponding water. Conditions at the dam are satisfactory.

2. Lower Dam This structure was purposely breached some years ago. The breach still exists and is sufficiently wide and deep to pass flood flows without ponding water. Conditions at the dam are satisfactory.

F. Veterans of Foreign War Dam

The pond volume is 100% filled with gravel, sand and silt. Absolutely no water whatsoever is stored by this dam. The masonry chute is broken, dilapidated and has failed. The masonry of the dam itself is spalled and is becoming poor in condition. However, the masonry section of the dam is quite wide and massive for the height involved. Consequently, the structure is safe at the present time. The dam and spillway are now nothing more than a waterfall in the brook bed. The dam as existing does not endanger persons and property downstream.

G. City of Chicopee Dam

Cracks in the mass masonry at the left abutment area on the gate operating structure are minor in nature and, at the present time are of no concern in connection with the safety of the dam. The spillway structure itself, across the river, is satisfactory.

At the right abutment adjacent to the Bay State Refining Co., plant, the stone masonry blocks have opened joints at some locations and vegetation is growing from other joints. There is evidence of stone block movement as the result of this condition. Continuation of the growth of vegetation plus weathering action in open joints due to thawing and freezing in the winter-time can cause further movement of the masonry blocks. It would seem advisable to kill the vegetation and repair the open joints during the coming year.

H. L. Slate Dam

This structure is somewhat dilapidated but not dangerous at the present time. Leakage occurs thru the masonry at the left of the spillway. The pond formed is small and shallow. As existing the structure does not endanger persons and property downstream. Therefore, the dam is satisfactory though in poor condition.

I. Chicopee Water Department Dams

1. Upper Dam The erroded areas on the face of the dam should be filled and repaired. The turf on the surface of the embankment should be treated and improved where needed. A seepage weir should be installed at the toe of the dam where readings of seepage can be taken from time to time and recorded on a periodic basis. Monthly readings might be desirable. The observation well in the embankment should be checked frequently to be certain that the height of water in the embankment is within proper limits. A record should be kept of the water level in the embankment.

   The end of the spillway chute is clogged with logs and debris. These materials should be cleaned out from the spillway chute.

2. Middle Dam This dam was found to be in satisfactory condition.

3. Lower Dam All stop logs were found to have been removed from the dam and no pond was formed whatsoever. Masonry at this dam was found to be satisfactory.

J. Fortier Dam

This dam is still in the same general condition as reported last year. Though the dam and the pond are a borderline case, the dam is too low in height and the pond too small in volume to come under County jurisdiction. The structure is inspected annually to be certain that it is not raised and thus the quantity of water in storage increased to a point where the dam would then come under County control.

The spillway at the dam is rather poor and unsatisfactory. However, it does not endanger the structure.

K. Messer Dam

Conditions at this structure are still the same as reported last year. The breach thru the dam is wide and deep. Most of the old pond volume has been filled in and a housing development constructed on a portion of the fill. The brook flow thru the old pond area is causing the formation of a deep gulley to the rear of the homes built at the old pond site. However, this is not the result of a dam but is directly related to a drainage problem in connection with an old dam site. The breach thru the dam is capable of passing flood flows without ponding water. Since the breach could be closed without too much difficulty, the site of this old dam will be inspected annually to be certain that free flows be maintained.

L. Dwight Dam

This dam was found to be in satisfactory condition. Flashboards were on the crest of the dam. Vegetation growing from the abutment masonry joints and masonry joints along the canal structure should be killed and removed to prevent damage to the masonry work.

M. Chicopee Electric Light Dept. Dam

As reported last year, this structure no longer is a dam but, with the elimination of the pond and the conversion of the conduit to a storm drain, the facilities are now nothing more than a surface water drainage system. The dam has been actually done away with and the old spillway conduit now carries surface water flow in the manner of a storm drain. The pond area has been completely filled and an asphalt paved parking lot built. A channel has been shaped and left thru the old pond site to carry the flow of the stream to the old spillway conduit. No water will now be ponded at the site of the dam and if the runoff from the watershed exceeds the capacity of the converted spillway system, now acting as a storm drain, excess runoff will pass thru a channel built on Electric Light Dept. property and terminate at the railroad tracks behind the property. As now existing, in the opinion of the undersigned, the structure and the facilities no longer come under County jurisdiction and thus inspections will not be required in the future.

N. Bemis Pond Dams

1. Upper Dam The embankment of this dam was found to be in satisfactory condition. Repairs and maintenance to the embankment and to the storm drain, as reported last year, have been taken care of. The main spillway is in satisfactory condition. The side spillways are also in satisfactory condition. The pond was found to be empty at the time of the last inspection on Nov. 23, 1960 and all stop-logs were out of the main spillway structure.

2. Lower Dam The embankment at this dam was found to be in very good condition. A few local spots on the turf will be in need of maintenance in the Spring of 1961. The new spillway was found to be in good condition. At the old spillway to the back of the masonry wall on the right side, just below the spillway crest, at a point adjacent to the upper end of the paved riprap, a void was noted. This void should be corrected. It should be cleaned out and then a few shovels full of wet concrete or a couple of sacks of prepared concrete mix should be made up and poured into this void. By pouring a slightly wet

and sloppy mix, all portions of the void will be filled and the condition corrected.

O. J. Stevens Arms Company Dam

This dam is in the same general condition as reported previously. The masonry has been purposely breached and as a result no pond is formed. The breach is wide enough and deep enough to pass storm flows.

P. Prosser Dams

1. Upper Dam This dam was found to be in satisfactory condition. It is a low masonry structure not more than 18-inches above the bed of the brook. Upstream of this small shallow dam the pond volume has been completely filled in. The masonry dam is now nothing but a waterfall in the flow of the brook. In spite of the lack of maintenance and care, the masonry is in fairly good condition.

2. Lower Dam This dam is in the same general condition as previously reported. The masonry is in fair condition. A breach exists under the masonry wall at the left side and allows for the passage of normal brook flow under the masonry structure. There is a pond formed in time of heavy runoff. However, the pond is small and the structure as existing does not endanger persons and property downstream.

Q. Oxford Country Club Dams

1. Upper Dam This dam is still breached as the result of the August 1955 flood. The breach is quite wide and deep. Consequently it passes normal flow of the stream as well as flood flows. Large concrete pipe noted at the site of the old dam would indicate that there may be some work planned. If any work to be done will create another pond, the Owner should be advised to check with the County before proceeding with any construction to be sure that any work done meets requirements of the County.

2. Lower Dam No repairs have been made to the condition as reported previously. The side of the spillway chute, downstream of the spillway crest, has been undermined and washed out. The masonry is broken and has failed. Remaining masonry is now failing. Both abutments that carry the foot bridge are being undermined and it is only a matter of time before they settle and tip over. A portion of the bottom of each of these abutments is now actually hanging in air. Failure of the abutments could cause a washout of the dam and loss of this structure.

Needed repairs should be made and they should be accomplished properly with suitable materials and good workmanship. Repairs done now will be much less costly than the reconstruction of the dam if it fails following the tipping of the foot bridge abutments.

Persons and property downstream will not be endangered to any great extent by failure of this dam. Water discharged from a failure will flow almost directly into the Chicopee River. The quantity of water stored is very small and thus would do no damage except minor washing of the Owners own property. However, a golfer might be walking across the foot bridge when it fails or one might be directly below the dam when failure occurs and thus, personal injury could take place.

It is recommended that the Owner of the dam be advised of this potentially dangerous condition and it is recommended that the dam be either repaired or properly breached.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

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SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Chicopee
November 20, 1964

The Hon. the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Inspections conducted at various times throughout the year of dams situated within the City of Chicopee, have now resulted in the inspection of all dams at least once during the year 1964. The following is a report of the general condition of the various dams located within Chicopee.

A. Fairview Fish & Gam Club Dams

1. Willimansett Brook Dam This dam, breached for many years, remains unchanged and the breach as it exists is wide and deep enough to pass flood flows. The entire pond area is becoming more and more overgrown with young trees and miscellaneous vegetation. It is doubtful if the owners will ever activate this dam again.

2. Trout Pond Dam This dam is no longer in existence. The site of the Sporting Club is now the site of a very large shopping center and the trout pond dam has been breached in connection with the work of constructing a high fill that forms a part of the shopping center parking area and driveway. The breach thru the old earth embankment is wide and deep and no water will be ponded in the future. The undersigned will make one more inspection at this site in 1965 since on the day of inspection this year, work of constructing the shopping center was still in progress. If all indications in the field in 1965 are such that the dam will be abandoned permanently, then a recommendation will be made at that time to drop the dam from the inspection routine.

B. Roberts Pond Dam

The embankment of this dam was found to be in good condition. The owner should cut brush growth in the Spring of 1965 and should fertilize, loam and seed the downstream face of the embankment, where needed, to promote a good growth of thick turf.

The spillway structure is in need of repair on the sloping wall just below the crest. A surface coating placed on this portion of the spillway has been eroded and should be replaced.

The pond should be drawn down for the Winter and Spring season. The gate at the dam should be left partially open until after the heavy Spring runoff. Spillway repairs as recommended hereinbefore should be made before the drawdown gate is closed in the Spring of 1965. All weeds and vegetation growing in the spillway approach channel should be cut down. On the day of inspection, water level in storage was about 6" below the crest of the dam.

C. Hampden Brewing Co. Dam

This stone masonry spillway structure was found to be in satisfactory condition. No flashboards were on the crest and water level in storage was about 1" above crest elevation. The abutment walls were satisfactory. However, downstream of the spillway itself, these walls need pointing up of the joints. Some pointing of stone masonry joints on the spillway could also be done. The condition is not bad as yet and there is no sign of movement of any of the stone masonry work as the result of jointing material having been washed out. It will probably be two or three years before the pointing of these joints will become a necessity. At that time, if the owner has not done any maintenance work to this structure, a recommendation will then be made that the joints of the stone work be repaired. The toe area just downstream of the spillway was in satisfactory condition.

D. Veterans of Foreign War Dam

This dam was in the same general condition as reported in 1963. The masonry is massive and though spalled, it is safe. The pond volume is completely filled to the crest elevation of the dam with sand and gravel washed in from upstream and no water whatsoever is stored by this structure. The dam as existing is now nothing more than a high earth retaining wall and failure of the dam would not release any water

since none can be stored. The dam is situated directly on the bank of the Chicopee River at a point where any discharge from the structure would merge directly with the much larger flow of the River. In view of the conditions and facts noted hereinabove, the dam is considered satisfactory.

In the report of last year, it was recommended that this dam be dropped from the inspection routine. However, since there is a possibility that someone some day may dig out the area behind the dam and reactivate the structure, inspections at the site will continue.

E. City of Chicopee Dam

The right abutment stone masonry was found to be in good condition. There is a small amount of erosion in the stone work at the face adjacent to the crest of the spillway section. The condition is not bad and can go for a number of years before repair work will be necessary. The spillway structure itself is in good condition and the toe area is satisfactory. The left abutment structure and the gatehouse were found to be satisfactory. About 2" of water passed over the spillway on the day of inspection.

F. L. Slate Dam

This dam is still quite dilapidated but is safe. The concrete wall that forms a portion of the dam is spalled and cracked. The spillway masonry and the related chute are in fair condition. This dam is very low in height, impounds a small volume of water and it would do little to no damage downstream if it should ever fail. Water level in storage was at the crest elevation of the spillway. In the opinion of the undersigned, though poorly maintained, the dam as a whole is safe.

G. Chicopee Water Dept. Dams (Now Mass. Dept. of Natural Resources)

1. Upper Dam The embankment concrete slope paving on the wet face was found to be in satisfactory condition. Water level in storage was at the crest elevation of the spillway. No flashboards were on the spillway.

   The masonry of the spillway crest and the concrete of the abutment walls was in satisfactory condition. The bottom of the central pier in the spillway at the crest is becoming badly eroded and reinforcing steel is exposed. However, this central pier has no particular function and apparently was built for the purpose of bridging the

H. Fortier Dam

This dam was found to be in the same general condition as previously reported. On the day of inspection the pond was quite low. The shore area around the pond has been built up with housing units. There is little chance that this pond will ever be enlarged by the raising of the dam. Inspections will be made for the next year or two and at that time, if conditions do not change, then a recommendation will be made that this small structure be dropped from the inspection routine.

I. Dwight Dam

The right abutment masonry and the natural ledge on which it is built were in good condition. The left abutment, canal headworks and canal spillway were in good condition. The canal spillway crest shows some sign of spalling but the condition is not bad. The crest of the main dam across the Chicopee River is in excellent condition. The cap stones are well aligned and on good grade. There is no sign of movement whatsoever at any of the stones on the main dam. Normal flashboards and related pins were on the crest. Water level in storage was drawn down below the masonry crest by about 4" and the flashboards were dry.

J. Bemis Pond Dams

1. Upper Dam The pond was empty and the main spillway wide open. No stop logs were in place. The embankment was in good condition. The pond normally formed by this dam has not been active for a number of years. At the side spillways the bar racks have been removed as requested. The spillways themselves were satisfactory.

2. Lower Dam This dam was inactive when inspected and apparently has not been active this year. The embankment was found to be in fair condition. If the dam is to be reactivated, the embankment should be improved by the removal of weed growth and the promotion of sod. Stone and gravel surfaced areas would not be altered to obtain a grass growth. Irregularities on the face of the embankment should be graded, loamed and seeded as necessary.

   The spillway shaft was found to be satisfactory and the drawdown gate open. At the overflow spillway located to the right of the embankment, the wing wall on the pond side of the dam is spalling badly at the left top and should be repaired if the dam is to be reactivated. Some spalling of concrete was noted on the spillway chute walls as well as on the spillway itself but the spalling is not of a serious nature as yet.

spillway. Even if this pier fails, it will have no detrimental effect on the structure. At the right abutment wall at the bottom, the concrete is becoming spalled but the depth of the cavity being formed is very shallow and repair work will not be needed for some time.

The spillway masonry chute was in satisfactory condition. Some spalling of concrete on the side wall of the spillway chute, particularly at the bottom of the left wall was noted, but the depth of the spalling is quite shallow. The spillway and the spillway chute were clear of debris.

The seepage measuring weir at the toe of the dam was not functioning and water was found to be passing under the weir structure. This weir should be maintained in operating condition and a monthly record kept of the amount of toe seepage. While making the inspection, the undersigned plugged the leakage under the weir with earth and after waiting for a sufficiently long period of time to obtain an accurate reading of the flow, it was determined that seepage was passing over the weir at the rate of about 75,000 gpd. This rate of seepage is within the range reported from time to time during special inspections of the dam earlier in 1964.

The water level in the observation well was checked on the day of inspection and it was found that the depth to the water table within the embankment was about 15-1/2 ft. from the lip of the well. This measurement is less than measurements previously reported. However, the depth to the water surface in the embankment is satisfactory and there is no danger of embankment movement due to the water table in the dam approaching the surface of the downstream slope.

2. Middle Dam This dam was found to be in satisfactory condition. The concrete spillway was okay. No flashboards were on the crest and only a small amount of debris was on the dam. The spillway chute and the toe area were satisfactory. Water level in storage was about 1" above the crest.

3. Lower Dam This small granite masonry dam with small earth downstream abutment fills was in excellent condition. All stop logs were out of the notch and the pond was found to be empty.

K. Oxford Country Club Dam

The small earth embankment at this dam is satisfactory. The rock fill at bridge abutments and at each side of the wooden spillway chute was found to be in fair condition. The concrete cap on the left side of the spillway was okay but the cap at the right side is cracked due to rock fill settlement. The condition, however, is not dangerous to the dam. The planking of the spillway was satisfactory. Water level was at the crest elevation. Though the dam as a whole is in fair to poor shape, it was considered safe.

Respectfully submitted,

George H. McDonnell

George H. McDonnell
County Hydraulic Engineer

GHM/mb

Chicopee Water Works - Takings - 1893



1893 Reports

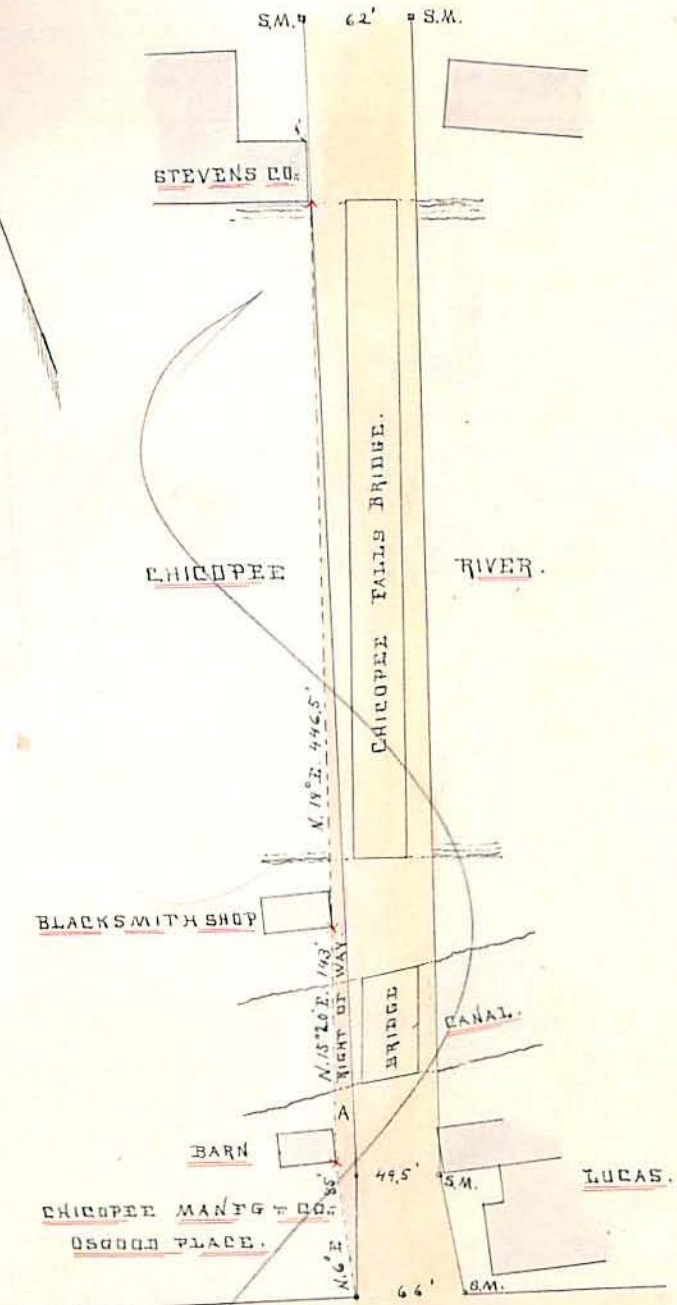
Location & Description of Land Taken for Chicopee Water Works - 1893. Recorded Hampden County Registry of Deeds May 25, 1893; James R. Wells, Register. Chapter 384, section 2, Acts for 1892.

Abutters	Chicopee Falls Manufacturing Company
Abutters	Keating, Thomas
Abutters	Shea, Ellen D
Abutters	Adams (est)
Abutters	Fuller, Heman (est)
Abutters	Fuller, Andrew
Abutters	Lyons, Lucien
Abutters	Stevens Company
Bridges	Chicopee Falls Bridge
City/Town	Chicopee
Name	Harris, Henry H
Streets	East Main Street
Streets	Morton's Lane
Water	Cooley Brook
Water	Chicopee River
Water	Morton Brook

LOCATION AND DESCRIPTION
OF
LAND TAKEN
FOR
CHICOPEE WATER WORKS
1893.

Received Hampden County Registry of Deeds. May 25th 1893 at 11h 0m A.M. and Filed

Attest. James R. Wells. Register.



LOCATION SHEET NO. 1

— OF —

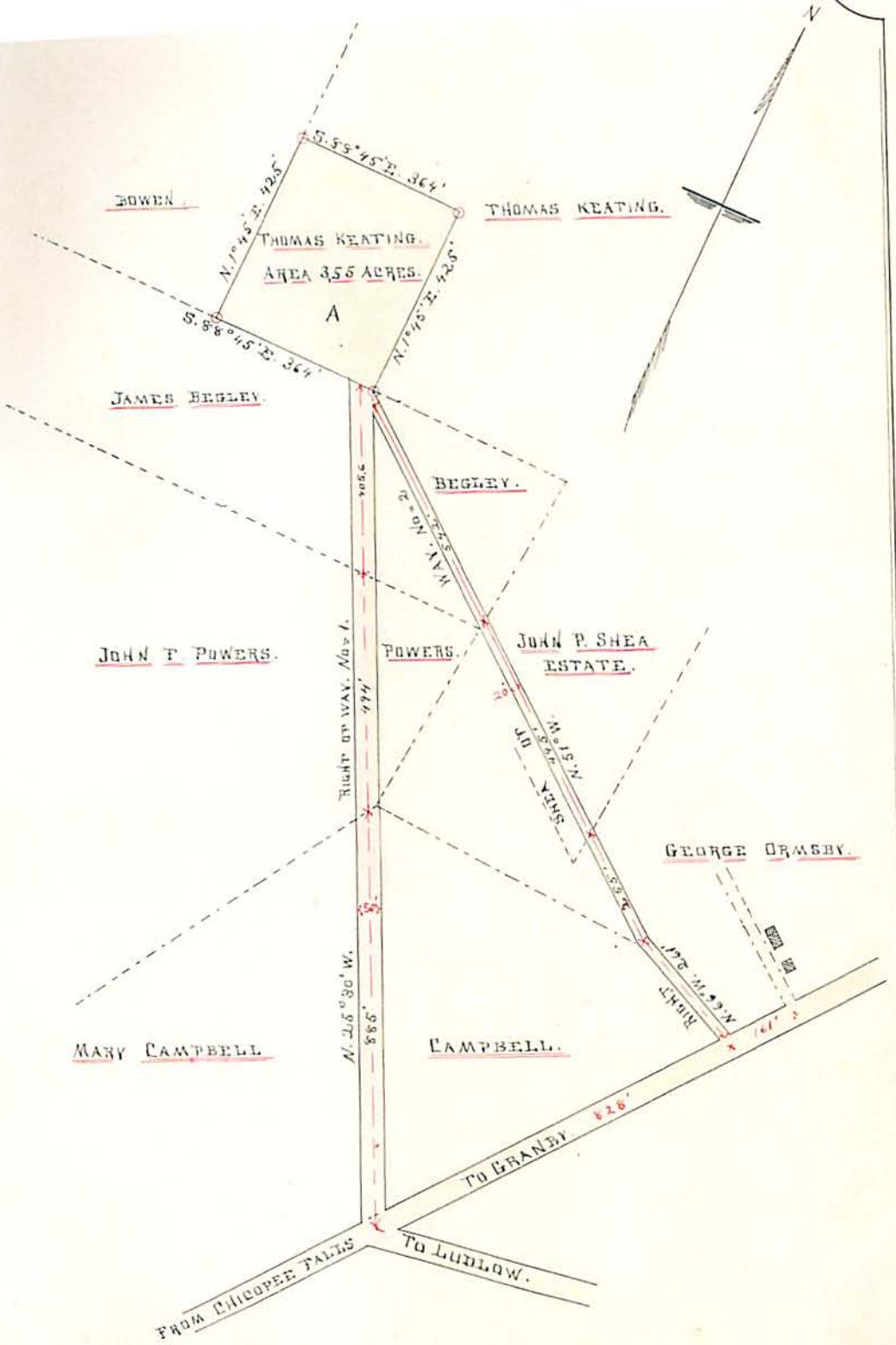
LAND TAKEN

FOR CHICOPEE WATER WORKS

CHICOPEE MASS.

— 1893 —

Scale 1" = 100'



LOCATION SHEET No. 2

— OF —

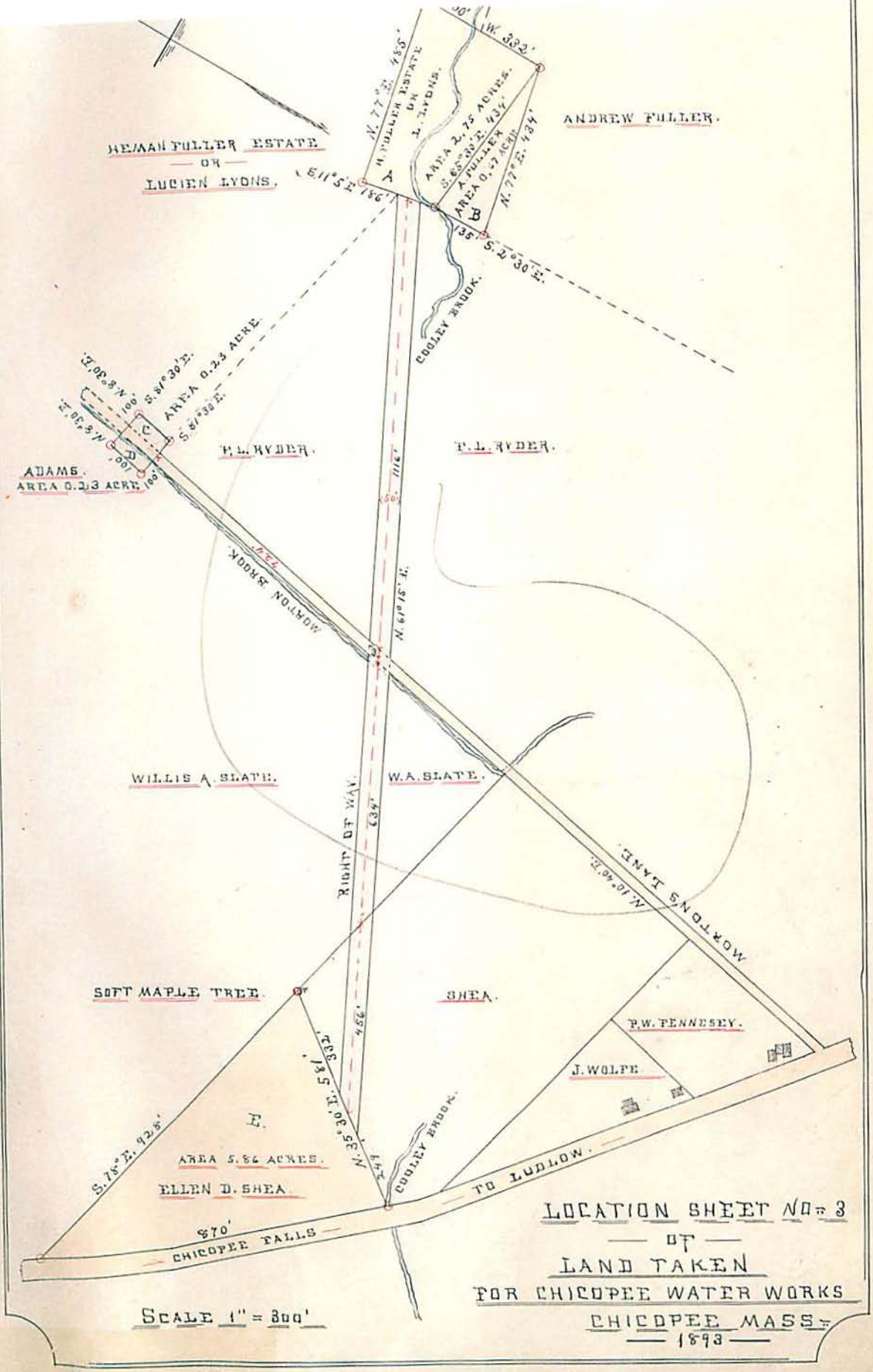
LAND TAKEN

FOR CHICOPEE WATER WORKS

CHICOPEE MASS.

— 1893 —

SCALE 1" = 300'


HEMAN FULLER ESTATE
— OR —
LUCIEN LYONS.
ANDREW FULLER.
H. FULLER ESTATE OR L. LYONS.
N. 77° E. 485'
W. 332'
AREA 2.75 ACRES.
S. 65° 30' E. 434'
A. FULLER
AREA 0.7 ACRE.
N. 77° E. 434'
S. 11° S. E. 186'
S. 2° 30' E.
COOLEY BROOK.
AREA 0.23 ACRE.
S. 81° 30' E.
P. L. RYDER.
ADAMS.
AREA 0.23 ACRE.
MORTON BROOK
N. 61° 15' E.
WILLIS A. SLATE.
W. A. SLATE.
RIGHT OF WAY.
MORTONS LANE
N. 10° 45' E.
SOFT MAPLE TREE.
SHEA.
P. W. FENNESEY.
J. WOLFE
S. 75° E. 92.5'
AREA 5.86 ACRES.
ELLEN D. SHEA
N. 35° 30' E. 581' 33"
456'
247'
COOLEY BROOK.
TO LUDLOW.
870'
CHICOPEE FALLS
SCALE 1" = 300'
LOCATION SHEET NO. 3
— OF —
LAND TAKEN
FOR CHICOPEE WATER WORKS
CHICOPEE MASS.
— 1893 —

L O C A T I O N A N D D E S C R I P T I O N

of

L A N D A N D R I G H T S O F W A Y T A K E N

for

C H I C O P E E W A T E R W O R K S

C h i c o p e e , M a s s .

Filed and recorded in Hampden County Registry of Deeds, May 1893, as required by Section 2, Chapter 384 of the Acts of the Legislature of Massachusetts, for 1892.

The following is a description of the location and boundaries of lands and rights of way taken by the authority of the Legislature of Massachusetts, Chapter 384, Section 1, of the Acts of 1892, for the New System of Water Works for the City of Chicopee, in the County of Hampden, and State of Massachusetts.

All the lands and rights of way so taken being situated within the limits of said City of Chicopee.

RIGHT OF WAY TAKEN AS SHOWN ON LOCATION SHEET No.1.

The following described right of way is taken for the purpose of laying, constructing and maintaining at all times a line of water pipes and other works for the new system of water works for the City of Chicopee, Mass., under and across the Chicopee River at Chicopee Falls, and also southerly from the southerly bank of said river, across lands belonging to the Chicopee Falls Manufacturing Company, and under and across the canal of said company, to East Main street, in said Chicopee Falls.

Beginning at an iron pin driven in the ground at the junction of the northerly line of East Main street in Chicopee Falls with the westerly line of the street leading northerly across Chicopee River. Thence from said iron pin N. 6°E. eighty-five (85) feet, to the southeasterly corner of the barn on the Osgood place, so called, belonging to the Chicopee Falls Manufacturing Company: thence N. 15° 20' E. one hundred and forty-three (143) feet to the southeasterly corner of a blacksmith shop standing on land of said company: thence N. 19° E.four hundred and forty-six and one half (446 1/2) feet, crossing said Chicopee River to a point one foot easterly from the southeasterly corner of the factory of the Stevens Company: thence southerly by the westerly line of the highway, across said river, and following said line of the highway, to the place of beginning, and being Lot A on Location Sheet No.1 herewith filed and recorded.

LAND TAKEN OF THOMAS KEATING.

Beginning at a stone in the ground at the south-easterly corner of land belonging to one Bowen, the said stone being on the northerly line of land belonging to James Begley and others. Thence N. 1° 45' E. by land of said Bowen, four hundred and twenty-five (425) feet, to a stake standing on the line between land of said Bowen and land of Thomas Keating: thence S. 88° 45' E. by land of said Keating, three hundred and sixty-four (364) feet to a stake: thence S. 1° 45' W. by land of said Keating, four hundred and twenty-five (425) feet to a stake standing at the northwesterly end of the northerly line of a right of way, hereinafter described, and leading northwesterly from the Granby road, so called, to said stake: thence N. 88° 45' W. by land of said Begly, three hundred and sixty-four (364) feet to the place of beginning, containing three and fifty-five hundredths (3.55) acres, and being Lot A on Location Sheet No.2 herewith filed and recorded.

The purpose for which this land is taken is for the construction and maintenance at all times of a standpipe and water mains, and other structures for the conduct, storage, and supply of water.

RIGHTS OF WAY TAKEN AS SHOWN ON LOCATION SHEET No.2.

The following described rights of way are taken for the purposes of laying, constructing and maintaining at all times, a line of water pipes for the new system of water works for the City of Chicopee, Mass., in and through said ways, and for passing and repassing over and through said ways at all times, for the purposes above set forth, and also for the purpose of transporting materials for a Stand Pipe, and such other structures or works as it may be necessary from time to time to erect, construct, complete and maintain for said water works.

RIGHT OF WAY No.1.

Beginning at a stake driven in the ground at the junction of the center lines of the highway leading from Chicopee Falls to Granby, with the highway leading to Ludlow, past the Roman Catholic Cemetery. Thence from said stake N. 25° 30' W. eight hundred and eighty-five (885) feet, on land of Mary Campbell, wife of James Campbell: thence same course four hundred and ninety-four (494) feet on land of John F.Powers: thence same course four hundred and five and one half (405 1/2) feet on land of James Begley and others to the southerly line of Lot A on Location Sheet No.2 herewith filed and recorded, and being right of way No.1 shown on said sheet.

The above described line is the center line of a right of way hereby taken, for the purposes above set forth, fifty (50) feet in width, being twenty-five (25) feet in

width on either side of said center line.

RIGHT OF WAY No.2.

Beginning at a stake driven in the ground on the northwesterly side of the highway leading from Chicopee Falls to Granby, and at a point ten (10) feet northeasterly from the easterly corner of land belonging to Mary Campbell, wife of James Campbell. Thence N. 66° W. on land of George Ormsby, two hundred and sixty-one (261) feet on a line parallel with the northeasterly line of said Mary Campbell's land, and distant ten (10) feet northeasterly therefrom: thence N. 51° W. two hundred and fifty-five (255) feet on land of said Ormsby: thence same course, four hundred and ninety-five (495) feet on land belonging to the estate of John P.Shea, deceased: thence same course, five hundred and forty-two (542) feet, on land of James Begley and others to the southerly line of Lot A on Location Sheet No.2 herewith filed and recorded, and being right of way No.2 shown on said sheet. The above described line is the center line of a right of way hereby taken for the purposes above set forth, twenty feet in width, being ten (10) feet in width on either side of said center line.

LAND TAKEN OF THE HEMAN FULLER ESTATE OR LUCIEN LYONS.

Beginning at a stake standing on land belonging to the Heman Fuller Estate or Lucien Lyons, said stake being at a point N. 11° 5' W., ninety-three (93) feet from the most northerly corner of a meadow lot belonging to Frank L.Ryder, formerly owned by G.M. and F.H.Morton. Thence from said stake N. 77° E. four hundred and eighty-five (485) feet to a stake standing on the westerly line of land belonging to the heirs of Royal Britton, deceased: thence S. 1° 30' W. by land of said heirs and land of Andrew Fuller, and crossing Cooley Brook, so called, three hundred and thirty-two (332) feet, to a stake standing at a corner of said Andrew Fuller's land: thence N. 85° 30' W. by land of said Andrew Fuller, four hundred and thirty-four (434) feet, to a stake standing in said Cooley Brook, and to land of said Ryder: thence N. 11° 5' W. by land of said Ryder, one hundred and eighty-six (186) feet to the place of beginning, containing two and seventy-five one hundredths (2.75) acres, and being Lot A on Location Sheet No.3 herewith filed and recorded.

Said land is taken for the purpose of constructing and maintaining at all times a dam and reservoir for storage purposes, suitable mains for the conduct of water, and for the purpose of preserving the purity of the water.

LAND TAKEN OF ANDREW FULLER.

Beginning at a stake standing in the center of Cooley Brook, so called, said stake being at a point S. 11° 5' E., ninety-three (93) feet from the most northerly corner of a meadow lot belonging to Frank L.Ryder, formerly owned by G.M. and F.H.Morton. Thence from said stake S. 85° 30' E. by land belonging to the Heman Fuller Estate or Lucien Lyons, four hundred and thirty-four (434) feet to a stake standing at a corner of land of Andrew Fuller: thence S. 77° W. by land of said Andrew Fuller, four hundred and thirty-four (434) feet to a stake standing on the easterly line of land of said Ryder: thence N. 2° 30' W. by land of said Ryder, one hundred and thirty-five (135) feet to the place of beginning, containing sixty-seven hundredths (.67) of an acre, and being Lot B on Location Sheet No.3 herewith filed and recorded.

Said land being taken for the purpose of constructing and maintaining at all times a dam and reservoir for storage purposes, of maintaining suitable mains for the conduct of water, and of preserving the purity of the water.

LAND TAKEN OF THE HEMAN FULLER ESTATE OR LUCIEN LYONS.

Beginning at a stake standing at the northwesterly corner of a meadow lot belonging to Frank L.Ryder, formerly owned by G.M. and F.H.Morton, said stake being in the center of Morton's Lane, so called. Thence from said stake N. 8° 30' E. by the center line of said lane, one hundred (100) feet to a stake: thence S. 81° 30' E. by land belonging to the Heman Fuller Estate or Lucien Lyons, fifty (50) feet to a stake: thence S. 8° 30' W. by land belonging to said estate or said Lyons, one hundred (100) feet to a stake standing on the northerly line of land of said Ryder: thence N. 81° 30' W. by land of said Ryder, fifty (50) feet to the place of beginning, containing twenty-three hundredths (.23) of an acre, and being Lot C on Location Sheet No.3 herewith filed and recorded.

Said land is taken [illegible]

LAND TAKEN SUPPOSED TO BELONG TO THE ESTATE OF ONE ADAMS.

Beginning at a stake standing at the northwesterly corner of a meadow lot belonging to Frank L.Ryder, formerly owned by G.M. and F.H.Morton, said stake being in the center of Morton's Lane, so called. Thence N. 81° 30' W. by land supposed to belong to the estate of one Adams, fifty (50) feet to a stake: thence N. 8° 30' E. by land of said estate, one hundred (100) feet to a stake: thence S. 81° 30' E. by land of said estate fifty (50) feet to a stake standing in the center of said lane: thence S. 8° 30' W. by the center of said lane one hundred (100) feet to the place of beginning, containing twenty-three hundredths (.23) of an acre, and being Lot D on Location Sheet No.3 herewith filed and recorded.

This land is taken for the purpose of erecting and maintaining at all times a reservoir for the storage of water, of sufficient water area, and a sufficient depth of water

LAND TAKEN OF ELLEN D.SHEA.

Beginning at a stake standing on the northeasterly side of the highway leading from Chicopee Falls Village to Ludlow, past the Roman Catholic Cemetery, the said stake being on the line between land of Ellen D.Shea and land of Willis A.Slate. Thence from said stake S. 78° E., by land of said Slate, nine hundred and twenty-eight (928) feet to a soft maple tree: thence S. 35° 30' W. by land of said Shea, five hundred and eighty-one (581) feet to a stake standing on the northeasterly side of said highway and in the center of Cooley Brook, so called, where said brook passes through the culvert under said highway: thence northwesterly by the northeasterly side of said highway, eight hundred and seventy (870) feet, to the place of beginning, containing five and eighty-six hundredths (5.86) acres, and being Lot E on Location Sheet No.3 herewith filed and recorded.

This land is taken for the purpose of erecting and maintaining at all times a storage basin, a pumping station and suitable buildings, dwelling, and other structures necessary to maintain the works

RIGHTS OF WAY TAKEN AS SHOWN ON LOCATION SHEET No.3.

The following described rights of way are taken for the purposes of laying, constructing and maintaining a line or lines of water pipes for the new system of water works for the City of Chicopee, Mass., in and through said rights of way, and for passing and repassing over and through said rights of way at all times, for the purposes above set forth, and also for the purpose of transporting materials for dams, gate-houses, and such other structures or works as it may be necessary from time to time to erect, construct, complete and maintain for said water works.

Beginning at a stake standing on the southeasterly line of Lot E on Location Sheet No.3 herewith filed and recorded, said stake being at a point N. 35° 30' E., two hundred and forty-nine (249) feet from a stake standing in the center of Cooley Brook, so called, where said brook passes into a culvert under the highway leading from the village of Chicopee Falls to Ludlow, past the Roman Catholic Cemetery. Thence from the first mentioned stake N. 61° 15' E., four hundred and fifty-six (456) feet on land of Ellen D.Shea: thence same course six hundred and thirty-four (634) feet on land of Willis A.Slate to the westerly side of Morton's Lane, so called: thence same course twenty (20) feet across said lane and to land of Frank L.Ryder: thence same course on land of said Ryder eleven hundred and sixteen (1116) feet to the westerly line of Lot A on said Location Sheet No.3.

The above described line is the center line of a right of way hereby taken for the purposes above set forth,

fifty (50) feet in width. being twenty-five (25) feet in width on either side of said center line.

Also one other right of way is hereby taken for the purposes above set forth, over and through Morton's Lane, so called, twenty (20) feet in width and extending from the above mentioned highway northerly to Lots C and D on said Location Sheet No.3.

I certify the foregoing to be a description of the location and boundaries of certain lands and rights of way taken by the City of Chicopee under the provisions of chapter 384 of the Acts of 1892 - for the purposes named in Section 1 of said Chapter, and for the purposes as hereinbefore stated -

Dated this 20th day of May A.D. 1893

Henry Harris

Mayor of Chicopee

Chicopee City - Bemis Pond, Szot Park - 1954



1954 Reports

Construction of Dam and bathing areas at Bemis Pond, Szot Park, Chicopee 1954.

Abutters	Szot Park
City/Town	Chicopee City
Water	Bemis Pond

d25 016

CONSTRUCTION OF DAM AND BATHING AREA

AT

BEMIS POND, SZOT PARK, Chicopee

CONSTRUCTION OF DAM AND BATHING AREA

at

DEMIX POND, SZOT PARK

****

CHICOPEE, MASSACHUSETTS

MAYOR WALTER J. TYBULSKI

CHICOPEE PARK COMMISSION

ARTHUR D. MAROTTE, CHAIRMAN

ANTHONY J. BEDNARZ — ROLAND L. HEBAULT

WILLIAM T. BLANCHARD — JOHN LASKOWSKI

JOSEPH PRESTON, SUPERINTENDENT OF PARKS

****

GORDON E. MACNEIL ASSOCIATES, CONSULTING ENGINEERS

JOSEPH C. GRAY, A.I.A., A.I.P., ARCHITECT AND CITY PLANNER

GOLDBERG LOMASSOURIAN ASSOCIATES

STRUCTURAL ENGINEERS

****

FEBRUARY, 1954

PART ONE

SECTION A.

Instructions to Bidders
Proposal Form for General Bidders
Certificate as to Corporate Bidder
Affidavit
Contract

SECTION B.

General Scope of Work

PART TWO

Division I. Dam

Division II. General Site Work

SECTION A

INSTRUCTIONS TO BIDDERS

1. TITLE OF PROJECT

DAM AND BATHING AREA, BEMIS POND, SCOT PARK, CHICOPEE, MASSACHUSETTS
Gordon E. MacNeill Associates, Consulting Engineers

2. SCOPE OF BID

The Board of Park Commissioners of the City of Chicopee, Massachusetts, (hereinafter called the "Owner") invites bids for the construction of a dammed bathing area at Bemis Pond, Scot Park, Chicopee, Massachusetts

3. SUBMISSION OF GENERAL BIDS

Sealed bids from general bidders will be received at the office of the Board of Park Commissioners, City Hall, Chicopee, Massachusetts

until _____P.M. (E.S.T.)_____ 1954

and at that place and time will be publicly opened and read.

The bidders shall submit his bid for the project in a sealed envelope bearing on the outside the name of the bidder, his address, and the title of the project for which the bid is submitted. (If forwarded by mail the sealed envelope containing the bid, and marked as directed above, must be enclosed in another envelope addressed to the Board of Park Commissioners at City Hall, Chicopee, Massachusetts, preferably by registered mail.)

4. BID PREPARATION

Each general bidder shall make an initial deposit by registered check payable to the City of Chicopee, or cash, with the Board of Park Commissioners, City Hall, Chicopee, Massachusetts or with Gordon E. MacNeill Associates, Consulting Engineers, 561 Boylston, Street, Boston, Massachusetts in the amount of twenty five ($25.00) to receive one complete set of drawings and specifications for the project. All copies of drawings, specifications and addenda are the property of the consulting engineer and shall be returned within ten (10) days after the opening of bids. The initial deposit will be refunded only if the documents are returned in good condition.

Bidders shall thoroughly familiarize themselves with the drawings and specifications and shall visit the project site and carefully examine it and familiarize themselves with existing conditions. Existing elevations, locations, and conditions mentioned in the specifications or indicated on the drawings are given for general

information only and are not guaranteed by the owner. The bidder will be required to meet conditions as they exist and complete work indicated on drawings or called for in specifications at his own expense and without extra cost to the owner.

5. BONDS

The following bonds will be required:

A. Proposal Guaranty for General Bid. A proposal guaranty in the form of cash, a certified check, or a bid bond, in the amount of three per cent (3%) of the amount of each bid. This guaranty shall be payable to the City of Chicopee and shall be submitted by each general bidder with each of his bids.

This guaranty will be returned to all but the three lowest responsible and eligible bidders within ten days after the opening of bids, and to the remainder after the contract has been executed or, in case of the rejection of all bids, within thirty (30) days after the opening of bids. Should any bidder on the proposed work to whom an award is made fail to enter into the contract therefor within ten (10) days after notice of award has been mailed or delivered to him, the amount so received from such bidder through his cash or certified check or bid bond shall become and be the property of the City of Chicopee as liquidated damages.

B. Performance Bond for General Bid. A performance bond in the amount of one hundred per cent (100%) of the contract price, with a surety company approved by the Owner, will be required of the successful bidder. The cost of this bond is to be paid by the bidder.

E. Bidders are referred to the General Conditions for supplementary date on bonds and insurance.

6. BIDDING PROCEDURE

Bidding procedure shall be in accordance with the laws (Ter.Ed.) Chapter 149, Sections 44A through 44D, both inclusive.

A. The bidding procedure shall be as follows;

(a) Bids from general contractors shall be for the complete project as specified and the general contractor shall be selected on the basis of such bid.

7. ADDENDA

If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or other proposed contract documents, he may submit to the Consulting Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any

interpretation of, or addition to, the proposed documents will be made only by Addendum duly issued and a copy of such Addendum will be mailed or delivered to each person receiving a set of documents. The engineer will not be responsible for any other explanation or interpretation or addition. All Addenda to bidders are to be incorporated in the proposal and will become part of the contract documents.

9. BID FORMS

Bidders are required to make their proposals in their pertinent form of the Proposal Form for General Bidders, copies of which are included in this Section.

The proposal must bear the written signature of the bidder. If the bidder is an individual doing business under a name other than his own name, the proposal must so state, giving the address of the individual. If the bidder is a partnership, the proposal must so state, setting forth the names and addresses of all partners and must be signed by a partner designated as such. If the bidder is a corporation, the proposal must bear the seal of the corporation and must be signed by a duly authorized officer or agent of such corporation, and the Certificate attached to the Form of Proposal must be executed and included.

Any bid which fails to name a price, both in words and in figures, per unit for each and every item wherein quantities are given, may be held to be informal and may be rejected, and in case of any discrepancy between the price written in words and that given in figures, the price written in words will be considered as bid. No alterations, erasures, or interlineations shall be made in the bid. Conditional bids will not be accepted.

The price or prices bid for the item or several items of the work shall include and cover the cost of furnishing all materials, labor and services necessary for the performance of all work set forth, described and shown in the proposal, specifications and on the drawings for the work.

10. AWARD OF GENERAL CONTRACT

The general contract shall be awarded on the basis of competitive bids to the lowest responsible and eligible bidder within thirty (30) days of the date when the bids are opened. The Owner, as the awarding authority, reserves the right to reject any or all bids if it be in the public interest to do so.

The Owner may require the lowest bidder, and such other bidders as he may determine, to file with him a statement, sworn to by the bidder, setting forth the financial condition, present plant and equipment, working organization and prior experience of the bidder, and such other pertinent information as the Owner may deem reasonably necessary to determine the qualifications of the bidder. Such statements shall be returned to all except the successful bidder upon request. Such statement shall be for the use and information solely of the Owner.

The person or persons to whom the contract may be awarded will be required to execute the contract within ten (10) days from the dak of the service of a notice to the effect that the contract has been awarded.

11. FORM OF CONTRACT

It is the intent that the contract be let on the basis of a stipulated sum.

Date of Completion of the contract for this project shall be June 15, 1954.

The Contractor will be required to complete the entire work to the satisfaction of the Owner, and in strict accordance with the plans, specifications and the contract. No compensation beyond the amount payable for the several classes of work and materials hereinafter enumerated which shall be actually performed and furnished at the prices therefor hereinafter stated, shall be due or payable for the entire work and materials.

The Contractor shall comply with the applicable laws of the Commonwealth of Massachusetts, by-laws of the City of Chicopee, Mass., and regulations of any other appropriate authority.

PROPOSAL FORM FOR GENERAL BIDDER

DAM AND BATHING AREA, SZOT PARK, BEMIS POND,

to: Board of Park Commissioners
City Hall
Chicopee, Massachusetts

(a) The undersigned proposes fo furnish all the labor, materials and services required for the construction of the Dam and Bathing Area at Bemis Pond, Szot Park, Chicopee, Massachusetts, in accordance with the accompanying specifications and drawings prepared by Gordon E. MacNeill Associates, Consulting Engineers, 561 Boylston Street, Boston, Massachusetts, for the sum specified below, subject to additions and deductions according to the specifications and in all respects according to the terms thereof.

(b) The undersigned agrees that if within thirty (30) days from the day named for delivering the proposal to the awarding authority, notice that this proposal will be accepted by the Owner shall be mailed to him at the business address given below, or shall be delivered to him, he will, within ten days thereafter, deliver to the Owner where directed a contract properly executed in triplicate (or otherwise) in the forms annexed with such changes therein as shall have been made by the Owner prior to the time named for delivery of this proposal, together with a bond of a surety company satisfactory to the awarding authority in the sum of one hundred (100 per cent of the contract price, the premium for which is to be paid by the contractor and is included in the contract price.

(c) The proposed contract sum is _____

_____(dollars) ($_____).

(d) The undersigned further agrees that the certified check or bid cond or cash left with the Board of Park Commissioners shall become the property of the City of Chicopee, Mass., as liquidated damages, if, after an award is made to him, he shall fail to enter into a contract therefor within ten (10) days after notice of said award has been mailed or delivered to him.

The undersigned agrees to commence operations on the dam and bathing area within ten (10) days after being awarded a contract and to prosecute the work to completion, subject to extension of time due to delay caused by a strike or boycott for which the contractor is in no way responsible and which the contractor cannot reasonably avoid, on or before June 15, 1954.

In submitting this bid, it is understood that the Owner reserves the right to reject any or all bids of the general bidder and to waive any informalities in bidding if it be in the public interest to do so. It is also agreed that this bid may not be withdrawn prior to thirty (30) days from the date of the opening of the bids without the consent of the Owner.

The undersigned states that he has received Addenda numbered _____.

Bidder:

By:

Business Address:

Date:

The bidder is a _____
Individual-Partnership-Corporation

The full names and addresses of all persons interested in this proposal, as principals, are as follows:

Individual Owner:

State full name and address of Owner. If business is carried on in any other name than that of the Owner, state such name and address:

Partnership:

State fullname and address of all partners.

Corporation:

Corporation is incorporated in the State of

President if

Treasurer is

Place of business is

Note: This proposal must bear the written signature of the bidder.

If the bidder is an individual doing business under a name other than his own name, the proposal must so state giving the address of the individual.

If the bidder is a partnership, the proposal must state, setting forth the names and addresses of all partners and must be signed by a partner designated as such.

If the bidder is a corporation, the proposal must bear the seal of the corporation and must be signed by a duly authorized officer or agent of such corporation.

CERTIFICATE AS TO CORPORATE BIDDER

I, _____, certify that I am the _____ of the corporation named as a Bidder in the within Bid Form; that _____, who signed said Bid Form on behalf of the Bidder was then _____ of said corporation; that I know his signature; that his signature thereto is genuine and that said Bid Form was duly signed, sealed and executed for and in behalf of said corporation by authority of its governing body.

(CORPORATE SEAL)

_____
Secretary - Clerk

Dated: _____

AFFIDAVIT

State of _____)
)
County of _____)

_____, being first duly sworn, deposed and says:

That he is _____

(insert in line above your position as partner or officer and name of partnership or corporation), the party making the foregoing proposal or bid, that such bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived, or agreed directly or indirectly with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or any other bidder, or to fix any overhead, profit, or cost element of said bid price, or that of any other bidder, or to secure any advantage against the City of Chicopee or any person interested in the proposed contract; and that all statements contained in said proposal or bid are true.

_____
(Name of bidder if the bidder is an individual)
(Name of partner if the bidder is a partnership)
(Name of officer if the bidder is a corporation)

Subscribed and sworn to this

_____ day of _____

_____
Notary Public

My Commission expires _____

CITY OF CHICOPEE, MASS.

BOARD OF PARK COMMISSIONERS

CONTRACT

for

CONSTRUCTION OF A DAM AND BATHING AREA AT BEMIS POND

THIS AGREEMENT, made and entered into this _____ day of _____ A.D. 1954, by and between the City of Chicopee, Massachusetts, through its Board of Park Commissioners, duly authorized in the premises and acting solely for the City of Chicopee and without personal liability, either individually or collectively, party of the first part, and

with legal address and principal place of business at

hereinafter designated as the Contractor, party of the second part:

WITNESSETH: That the parties to these presents, each in consideration of the undertakings, promises and agreements on the part of the other herein contained, have undertaken, promised and agreed, and do hereby undertake, promise and agree, the party of the first part for himself and for his successors and assigns, and the party of the second part for themselves and for their heris, executors, administrators, successors and assigns, as follows:

Article I. Wherever the words defined in this article, or pronouns used in their stead, occur in this contract, and the specifications hereto attached, they shall have the meanings given. Definitions

The word "Commission" shall mean the Board of Park Commissioners, of the City of Chicopee, Mass., or any agency or officer duly authorized to act in its place in the execution of the work required by this contract.

The word " Engineer" shall mean any person designated by the Board of Park Commissioners of the City of Chicopee, acting directly or through properly authorized agent, such agents acting within the scope of the particular duties entrusted to them.

The word "Contractor" shall mean the party of the second part, above designated, entering into this contract for the performance of the work required by it and the legal representatives of said party, or the agent appointed to act for said party in the performance of the work.

The word "Contract" shall mean, collectively, all of the covenants terms and stipulations in these articles of agreement, and in the supplementary documents hereto attached which constitute essential parts of the agreement, and are hereby made such parts thereof, to wit:

Advertisement
Instructions to Bidders
Proposal Forms
Contract
Specifications
Contract Drawings

The word "Specifications" shall mean collectively all of the terms and stipulations contained in the general and detailed specifications appended to this agreement.

The words "Contract Drawings" shall mean the drawings hereto attached, together with such supplementary drawings as may be issued or approved by the Engineer from time to time as herein elsewhere provided.

Wherever in the specifications or upon the contract drawings the words directed, required, permitted, ordered, instructed, designated, prescribed, considered necessary, or words of like import are used, it shall be understood that the direction, requirement, permission, order, instruction, designation, prescription or decision of the Engineer is intended; and similarly the words approved, acceptable, satisfactory, or words of like import, shall mean approved by, or acceptable or satisfactory to the Engineer, unless another meaning is plainly intended.

Article II. The contractor shall do all the work and furnish all the materials, tools, labor and equipment necessary, proper and incidental to the construction of the dam and bathing area and required by the contract, in the manner, within the time, and for the consideration herein stipulated and agreed upon. Work to be done.

Article III. All the work under this contract shall be done to the satisfaction of the Engineer, who shall in all cases determine the amount, wuality, acceptability and fitness of the several kinds of work and materials which are to be paid for hereunder, and shall decide all questions which may arise as to measurement of quantities and the fulfillment of the conditions of this contract on the part.... Engineer to decide.

of the Contractor, and his determination and decision thereon shall be final and conclusive and such determination and decision, in case any question shall arise, shall be a condition precedent to the right of the Contractor to receive any money hereunder.

Work to be done in accordance with drawings and specifications

Article IV. The work during its progress and upon its completion must conform with the Contract Drawings and Specifications, and with other directions of the Engineer, as given from time to time during the progress of the work, under the terms of this contract; in no case shall any work in excess of the requirements of the drawings be paid for unless authorized in writing by the Engineer or his agents especially authorized thereto.

Time and manner of doing work.

Article V. The Contractor shall commence the work after the contract has been executed by the City and upon notice from the Board of Park Commissioners or Engineer signifying that the work must be started.

The Contractor shall prosecute the work as directed by the Engineer until completion.

The Date of Completion shall be the date of the final estimate prepared under the conditions herein specified.

The Contractor shall commence the work at such points and shall thereafter continue at such points and in such order or precedence as the Engineer may approve.

Extension of time

Article VI. If the Contractor is obstructed or delayed in the prosecution or completion of the work by any damage that may happen thereto by the unusual action of the elements, or by the abandonment of the work by the Employees in a general strike, the Contractor shall have no claim for damage for any such cause or delay, but he shall in such case be entitled to such extension of time specified herein for the completion of the work as the Engineer shall in writing certify to be just and proper; provided, however, that claim for such extension of time is made by the Contractor in writing within one (1) month from the time when such alleged cause for delay shall occur.

Drawings and Specifications mutually explanatory

Article VII. The Contract Drawings and Specifications are intended to be explanatory of each other, but should any discrepancy appear or any misunderstanding arise as to the import of anything contained in either, the explanation of the Engineer shall, in all cases, be final and binding upon the Contractor. Any corrections of errors or ommissions in the Drawings and Specifications may be made by the Engineer when such correction is necessary for the proper fulfillment of their intention as determined by him

Changes

Article VIII. This contract and the specifications herein contained and the drawings herein referred to, may be changed from time to time as may be agreed in writing between the parties hereto, in a manner notmaterially affecting the substance thereof nor materially increasing the amount to be paid, in order to carry out and complete more fully and perfectly the work herein agreed to be done and performed.

Article IX. In case work other than that specified shall be found necessary, the Contractor shall perform the whole or such portion of such work as the Engineer may require, and agrees to accept as full compensation for such extra work the actual and necessary net cost of the work as determined by the Engineer, plus fifteen (15) per cent, of such cost. Such actual net cost shall cover all labor and materials necessary for the performance of the extra work, including any extraordinary expenses incurred directly on account thereof, the wages of foreman and the expense attached to the Contractor's liability insurance covering the labor so employed. In computing such net cost, however, no interest, rent or depreciation of plant, nor services of a general superintendent or administrative force shall be included; the allowance of fifteen (15) per cent shall include all such expense for superintendence, administration, interest, rent depreciation, general expenses of plant and contingencies; and shall include all profit. The Contractor shall, before the tenth day of the month succeeding that in which any extra work shall have been performed, file with the Engineer an account giving the itemized cost of such extra work, and shall give the Engineer access to all accounts, bills and vouchers relating thereto. In case the Contractor fails to file, at the time above mentioned, such account for extra work, he shall have no claim for compensation for the same against the Commission, over and above the allowance certified by the Engineer. No extra work will be paid for unless ordered in writing by the Engineer.

Contractor's claims for damage.

Article X If the Contractor claims compensation for any damage alleged to have been sustained by reason of any act or omission of the Commission or any of its agents, he shall, within one (1) week after the sustaining of such damage, make a written statement to the Commission of the nature of the damage sustained, and shall, on or before the fifteenth (15th) day of the month succeeding that in which any such damage shall have been sustained, file with the Engineer an itemized statement of the details and amounts of such damage, and unless such statements shall be made as so required, his claim for compensation shall be forfeited and invalid, and he shall not be entitled to payment for any damage.

Article XI. The Contractor shall keep the work under his personal control, and shall not assign, transfer, convey, sublet or otherwise dispose of this contract, or his right, title or interest in or to the same or any part thereof, without the previous consent in writing of the Commission, and he shall not assign, by Power of Attorney or otherwise, any of the moneys to become due and payable under this contract, unless by and with the like consent of the Commission; provided that nothing herein contained shall be construed or hinder, prevent, or affect an assignment by the Contractor for the benefit of his creditors, made pursuant to existing statutes of the Commonwealth of Massachusetts.

Not to sublet or assign.

Article XII. The Contractor shall give his personal attention constantly to the faithful prosecution of the work, and shall be present, either in person or by a duly authorized representative, on the site of the work, continually during its progress; such representative shall have authority to receive and to act without delay upon all instructions of the Engineer or his assistants in the prosecution of the work in conformity with this contract.

Representative on work.

Article XIII. The Commission and the Engineer and other agents and employees of the Commission may for any purpose, and its other contractors may for all purposes required by their contract, enter upon the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefor. Any differences or conflicts which may arise between the Contractor and other contractors or agents of the Commission in regard to their work shall be adjusted and determined by the Engineer.

Furthermore, the Commission and the Engineer and their assistants and agents shall, at all times, have access to all places where materials are being prepared for use under this contract, and shall have full facilities for unrestricted inspection of such materials.

Access to work and to placed of manufacture.

Article XIV. The contractor shall provide the services and equipment of competent personnel to provide lines and grades for the work and shall be responsible for their accuracy.

Lines and grades.

Article XV. Whenever the Constractor is not present on any part of the work where it may be desired to give directions, orders may be given by the Engineer and shall be received and obeyed by the Superintendent or foreman who may have charge of the particular work upon which the orders are given.

Orders

Article XVI. The Contractor shall employ only competent and skillful mento do the work, and whenever the Engineer shall notify the Contractor, in writing, that any man on the work is, in his opinion, incompetent, unfaithful or disorderly, or in any other way unsatisfactory, such man shall be discharged from the work and not again employed on it except with the consent of the Engineer

Competent help to be employed.

Regulations Laws and Ordinances

Article XVII. The Contractor shall keep himself fully informed of all laws, ordinances and regulations in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency shall be discovered in this contract, or in the drawings or specifications herein referred to, in relation to any such law, ordinance, regulation, order, or decree, he shall forthwith report the same in writing to the Engineer. He shall at all times himself observe and comply with, and shall cause all his agents and employees to observe and comply with all such existing and future laws, ordinances, regulations, orders and decrees; and shall protect and indemnify the Commission and its officers and agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

Right of property in materials

Article XVIII. Nothing in the contract shall be considered as vesting in the Contractor any right of property in materials used, after they shall have been attached or affixed to the work or soil, nor in materials which have been estimated for partial payment, but all such materials shall, upon being so attached or affixed, or estimated, become the property of the Commission.

Defective work

Article XIX. Inspection of the work shall not relieve the Contractor from any of his obligations to fulfill the contract as herein described, and defective work shall be made good, and unsuitable materials may be rejected, notwithstanding that such work or materials may have been previously overlooked by the Engineer and accepted or estimated for payment. If the work or any part thereof shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith make good such defect in a manner satisfactory to the Engineer, and if any material brought upon the ground for use in the work, or selected therefor, shall be condemned by the Engineer as unsuitable or not in conformity with the specifications, the Contractor shall forthwith move such material from the vicinity of the work. If the Contractor shall fail to remove or replace any defective or damaged materials or work after reasonable notice, the Engineer may cause such materials or work to be removed or replaced, and the expense thereof shall be borne by the Contractor.

Conditions under which the Commission may complete the work.

Article XX. If the work to be done under this contract shall be abandoned, or if this contract shall be sublet or the contract or any claim thereunder shall be assigned by the Contractor otherwise than as heretofore specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing to the Commission, that the conditions herein as to the rate of progress are not fulfilled or that the work, or any part thereof, is unnecessarily or unreasonably delayed, or the Contractor is violating any of the provisions of this contract, that Commission may notify the Contractor to discontinue all work, or any part thereof, and thereupon the Contractor shall discontinue such work or such part thereof as the Commission may designate, and the Commission may thereupon, by contract or otherwise, as it may determine, complete the work, or such part thereof, and charge the expense thereof to the Contractor, and may take possession of and use therein such materials, animals, machinery, equipment, implements and tools of every description as may be found upon the site of said work. The expenses so charged shall be deducted and paid by the Commission out of any or any part of money then due or to become due the Contractor under this contract, or any part thereof; and in case such expense is less than the sum which would have been payable under this contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case such expense shall exceed that latter sum the Contractor, or in case of his default, his surety, shall pay the amount of such excess to the City of Chicopee.

Responsibility Of Contractors Indemnity etc.

Article XXI. The Contractor shall take all responsibility of the work and shall take precautions for preventing injuries to persons and property in or about the work; shall bear all losses resulting to him on account of the nature of the land in or on which the work is done if different from what was estimated or expected, or on account of the weather, elements or other causes; shall cover and protect the work from damage by flood or front action, and all injury to the same before the completion of the contract shall be made good by him; and he shall assume the defense of and indemnify and save harmless the Commission from all claims, likewise each member of the Commission and its officers and agents, relating to labor or materials furnished for the work; to inventions, patents and patent rights used in the work or in doing the work; to injuries to any person or corporation received or sustained by any act of the Contractor or his employees in doing the work, or in consequence of any improper materials, implements or labor used therein; and to any act, omission or neglect of the Contractor and his employees therein.

Article XXII. The Commission may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefor, to the payment of any expenses, losses or damages incurred by the Commission and determined as herein provided, and may retain until all claims are settled so much of the moneys as the Commission shall be of the opinion will be required to settle all claims of the nature specified in Article XXI against the Commission and its officers and agents, and all claims for labor or materials for the work, notice of which, signed and sworn to be the claimants, shall have been filed in the office of the Commission. The Commission may also with the written consent of the Contractor, use any money retained, due or to become due under this contract, for the purpose ofpaying for labor or materials for the work.

Money may be retained.

Article XXIII. The Commission shall pay and the Contractor shall accept as full compensation for everything furnished and done by the Contractor under this contract, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all rights of every description connected with the work, and for all expenses incurred by or in the consequence of the suspension of discontinuance of the work as herein specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, the sum of

Price of work.

Article XXIV. In order to assist the Contractor to prosecute the work advantageously, the Engineer shall, from time to time during the active progress of the work and generally once each month, make in writing an estimate, such as in his opinion shall be just and fair, of the amount of work done to the time of such estimate and the value thereof in accordance with the terms of the contract.

Partial estimates and payments.

Upon such partial estimate being made and certified in writing to the Commission, the Commission shall retain ten (10) per cent, of the total estimated valuation as part security for the fulfillment of the contract on the part of the Contractor, and shall pay to the Contractor prior to the fifteenth day of the month after the date of the estimate the balance not retained as aforesaid after deducting therefrom all previous payments and all amounts to be kept or retained under the provisions of this contract or as may be authorized or required by any law of the Commonwealth of Massachusetts.

Payments may at any time be withheld if the work is not proceeding in accordance with the contract, and at the option of the Commission estimates may be made more frequently and a smaller amount may be retained than as aforesaid.

Final estimate and payment

Article XXV. Whenever in the opinion of the Engineer the Contractor shall have completely performed the contract on his part, the Engineer shall so certify in writing to the Commission and shall submit a final estimate of the total amount of work done by the Contractor, and of the value of such work under and according to the terms of this contract. Upon the expiration of thirty (30) days after the date of acceptance of the work by the Commission, the Commission shall pay to the Contractor the entire sum so found to be due hereunder, after deducting therefrom all previous and all amounts to be kept or retained under the provisions of this contract.

All prior partial estimates and payments shall be subject to correction in the final estimate and payment; the final estimate and the measurements upon which it is based may be made without notice thereof to the Contractor.

Waivers

Article XXVI. Neither the acceptance of the Commission or its Engineer, or any of its employees, nor any order, measurement or certificate by the Engineer, nor any order by the Commission for payment of money, nor any payment for, nor acceptance of the whole or any part of the work by the Engineer or the Commission, nor any extension of time, nor any possession taken by the Commission or its employees, shall operate as a waiver of any portion of this contract or of any power herein reserved to the Commission, or of any right to damages herein provided; nor shall any waiver of any breach of this contract be held to be a waiver of any other or subsequent breach. All remedies provided in this contract shall be taken and construed as cumulative; that is, in addition to each and every other remedy herein provided.

Final agreement to terminate liability of commission.

Article XXVII. No person, firm or corporation, other than the signer of this contract as Contractor, now has any interest hereunder, and no claim shall be made or be valid, and neither the Commission nor any of its agents shall be liable for or be held to pay any money, except as provided in Articles VIII, IX, X, XXIII, XXIV, and XXV. The acceptance by the Contractor of the final payment aforesaid shall operate as, and shall be, a release to the Commission and its agents, from all claim and liability to the Contractor for anything done or furnished for, or relating to, the work or for any act or neglect of the commission or of any person relating to or affecting the work.

Article XXVIII. Public Employee May Select Lodging: Every employee in public work shall lodge, board and trade where and with whom he elects; and no person or his agents or employees under contract with the Commonwealth, a county, city or town, or with a department, board commission or officer acting therefor, for the doing of public work shall directly or indirectly require, as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person, and all as provided in Chapter 149, Section 29, of the General Laws, as amended.

which said Chapter and Section are made a part hereof as if at length set forth herein.

Article XXXIII. Performance Bond: The Contractor shall furnish to the City bond of security, in an amount equal in full to the sum payable of all the terms and conditions of the CONTRACT, and the payment of all obligations arising thereunder, and as required by the Charter of the City of Chicopee as set forth in the Acts of 1897, Chapter 239, Section 88, as amended, which said Chapter and Section are made a part hereof as if at length set forth herein, and the premium for such bond shall be paid by the Contractor.

The Performance and Labor and Material Bonds may be made up in one instrument.

Article XXXIV. In doing the contemplated work under this contract, preference shall be given to citizens of Chicopee.

Article XXXV. Both the address given in the bid or proposal upon which this contract is founded and the Contractor's office at or near the site of the work are hereby designated as places to either of which notices, letters and other communications to the Contractor shall be mailed or delivered. The delivering at either of the above named places, or depositing in a postpaid wrapper directed to the first named place, in any Post Office box regularly maintained by the Post Office, of any notice, letter or other communication to the Contractor, shall be deemed sufficient service thereof upon the Contractor and the date of said service shall be the date of such delivery or mailing. The first named address may be changed at any time by an instrument in writing executed and acknowledged by the Contractor and delivered to the Commission. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter or other communication upon the Contractor personally.

Article XXIX. Preference to Veterans and Citizens: In the employment of mechanics, teamsters, chauffeurs and laborers in the construction of public works by the Commonwealth, or by a county, town or district, or by persons contracting or sub-contracting for such works, preference shall first be given to citizens of the Commonwealth who have served in the Army or Navy of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to perform the work to which the employment relates; and secondly, to citizens of the Commonwealth generally, and, if they cannot be obtained in sufficient numbers, then to citizens of the United States, and all as required by the General Laws, Chapter 149, Section 26, as amended, which said Chapter and Section are made a part hereof as if at length set forth herein.

Article XXX. Hours and Days of Employment: With regard to the persons in his employ, the Contractor shall comply with the provisions of General Laws, Chapter 149, Section 34, as amended, which reads as follows:

"Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen or mechanics, foremen or inspectors, to which the Commonwealth or any county or any town, subject to Section 30 is a party, shall contain a stipulation that no laborers, workmen, or mechanic, foreman or inspector, working within the Commonwealth, in the employ of the contractor, sub-contractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty eight hours in any one week, or more than six days in any one week, except in cases of emergency, or in case any town subject to Section 31 is a party to such a contract, more than eight hours in any one day, except as aforesaid; provided that in contracts entered into the Department of Public Works for the construction or reconstruction of highways there maybe inserted in said stipulations a provision that said department, or any contractor or sub-contractor for said department, may employ laborers, workmen, mechanics foremen and inspectors, for more than eight hours in any one day in such construction or reconstruction when, in the opinion of the Commissioner of Labor and Industries public necessity so requires. Every such contract not containing the aforesaid shall be null and void."

ArticleXXXI. Workmen's Compensation: The Contractor shall before commencing performance of the Contract herein entered into, provide by insurance for the payment of compensation and the furnishing of other benefits under General Laws, Chapter 149, Section 34A, as amended, to all persons being employed under the Contract and the Contractor shall continue such insurance in full force and effect during the term of the within contract, as required by General Laws, Chapter 149, Section 34A, as amended, which said Chapter and Section are made a part hereof as if at length set forth herein.

IN WITNESS WHEREOF, on the day and year first above written, the City of Chicopee has caused its corporate seal to be hereto affixed, and these presents to be signed in its name and behalf by its BOARD OF PARK COMMISSIONERS, and

hereunto set their individual hands and seals, this being one of four counter-part originals of the within agreement, all being executed as aforesaid, and constituting together one and the same agreement.

CITY OF CHICOPEE

_____

_____

_____

_____

_____

BOARD OF PARK COMMISSIONERS

Approved:

_____

M A Y O R

Approved as to form

_____

City Solicitor

_____

_____

_____

COMMONWEALTH OF MASSACHUSETTS

Hampden, ss. Chicopee, _____ A.D. 1954

Then personally appeared above named , known to me, and made oath that he, the said and the duly appointed and qualified members of the BOARD OF PARK COMMISSIONERS of the City of Chicopee, and that each of them subscribed his name to the foregoing instrument, in execution of such instrument, in accordance with the authority of law conferred upon them, before me,

_____
Notary Public (SEAL)

Commission expires _____

COMMONWEALTH OF MASSACHUSETTS

, ss. _____, 19

Then personally appeared the above named known to me to be the described in and who executed the foregoing instrument, before me,

_____
Notary Public (seal)

Commission Expires _____

I, the undersigned, the duly authorized and acting legal representative of the City of Chicopee, Massachusetts, do hereby certify as follows:

I have examined the foregoing contract and surety bond and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representative; that said representative has full power and authority to execute agreements on behalf of the respective parties named thereon; and that the foregoing agreement constitutes valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions and provision thereof.

_____

(Title)

SECTION B

GENERAL SCOPE OF WORK

1. SITE

The Contractor shall accept the premises in their present condition.

2. GENERAL

Certain work in connection with the construction of the bathing area has been completed. This work has altered the existing contour as indicated on plans. Work outside the scope of this contract will be carried on simultaneously with the work under this contract. The contractor shall cooperate with other contractors and City employees to coordinate his work with theirs to ensure completion of all work in the area without unnecessary delay.

The work to be done under this contract includes all labor, materials and equipment to complete all work required for the construction of the dam and bathing area and associated facilities to complete the work shown in the drawings in strict accordance with the Drawings and Specifications, together with any Addenda which may be issued during the bidding period.

The work includes handling of sub-surface conditions which may be encountered at no additional cost to the owner.

The work also will include handling of sub-surface conditions which may be encountered at no additional cost to the owner.

The work also will include later instructions, modifications to, additionsto or deletions from the contract as agreed by the Owner and the Contractor during the construction period in accordance with procedures described in these specifications.

Items of work not included in this contract but shown on the plans are noted on the drawings.

3. TESTS

The General Contractor shall assume the overall responsibility with respect to the Owner, for the performance of all tests included in the Specifications, and for the performance and costs of all tests, for which responsibility is not specifically assigned to others, required to establish the specified characteristics of all materials.

4. BONDS

Bonds will be required as called for in the Instructions to Bidders.

5. PERMITS

All building permits, certificates, and licenses shall be paid for by the Contractor.

6. TEMPORARY TOILETS

The Contractor shall provide and maintain temporary sanitary toilets adequate for the use of all employees and in conformity with the requirements of pertinent Codes and Regulations.

7. TEMPORARY WATER SUPPLY

The Contractor shall provide and pay for all water required for the construction work and shall furnish all necessary connections, equipment and labor for installing and maintaining the same, including that required for fire protection during the project work.

8. TEMPORARY LIGHT AND POWER

The Contractor shall provide and pay for all electric energy for light and power as required to complete the work of the Contract, including the labor and materials for temporary wiring, fixtures, transformers and other equipment.

9. TEMPORARY HEAT

The Contractor shall provide and pay for all special equipment and for the fuel and service for temporary heating as required for the proper protection and drying of all work. The method of providing temporary heating shall be subject to the approval of the Engineer.

10. STORAGE OF OILS AND GASOLINE

The storage on the Project site of any and all oils, gasoline, or other combustibles, shall be subject tothe requirements of pertinent authorities having jurisdiction.

11. WINTER CONDITIONS

The General Contractor shall assume responsibility with respect to the Owner for the erection and maintenance in operation of all structures and facilities required for the protection and continuance of work during winter conditions.

12. PROTECTION

Article 12, Protection of Work and Property, of the General Conditions, shall be and is supplemented as follows:

a. General: The recommendations of the Manual of Accident Prevention in Construction, latest edition, published by the Associated General Contractors of America, are hereby made a part of this specification to the extent that such recommendations are not in contravention of applicable laws.

b. Fire Protection: The Contractor shall provide and maintain in good working order under all conditions, suitable and adequate fire protection equipment and services, approved by the Clerk of the Works.

c. Watchman: The Contractor shall maintain adequate watchman services for the duration of the project and shall be responsible, with respect to the Onwer, for all materials and equipment on the site. He shall make good, at his own expense, all damage or loss to the structures.

13. ENGINEER

The Contractor shall employ, within the terms of his contract, a qualified engineer, who shall lay out the site improvements, establish grades and levels and a permanent bench mark, and do the usual engineering works as required, including levelling and checking.

14. INTENT OF DOCUMENTS

It is the intent that all materials shall be furnished and all work accomplished in strict accordanc e with the grades of materials, standards of workmanship, and Standard Specifications listed or mentioned in the documents of the contract. Materials shall be free from defects impairing strength, durability or appearance.

The mention of any method of installation,erection, fabrication, or workmanship shall not operate to make the Contractor an agent, but shall be for the sole purpose of establishing a standard of quality.

15. SPECIFICATION ARRANGEMENT

The separation of the specifications into Divisions is for convenience of reference only and is not intended to limit or prescribe contracts between the Contractor and Sub-contractor.

16. GUARANTY-WARRANTY

The Contractor shall guarantee all work as called for in the Divisions of this specification, whether performed by himself or by his subcontractors, for one year from the date of substantial completion.

The phrase "one year fro date of substantial completion" shall be interpreted to mean one year from the date of final acceptance of the entire project by the Owner.

17. SCHEDULE OF MINIMUM WAGES

The following minimum hourly wage rates have been established by the Commissioner of Labor and Industries in accordance with Chapter 149 and 461 of the General Laws of the Commonwealth of Massachusetts. They shall be kept posted in a conspicuous place through the entire time work is in progress.

OCCUPATIONS	RATE PER HOUR
Crane Operator	2.65
Power Shovel Operator	2.65
Bulldozer Operator	2.15
Compressor Operator:	
220 cu.ft. or less	1.75
Over 220 cu.ft.	2.15
Jack Hammer Operator	1.52-1/2
Roller Operator	2.15
Pumpman	2.15
Cement Finisher	2.97-1/2
Stone Mason	2.97-1/2
Mason Tender	1.52-1/2
Carpenter	2.42-1/2
Pile Driver & Cofferdam Builder	2.75
Iron Worker	3.05-1/2
Blaster	1.65
Truck Driver	1.89-1/2
Asphalt Raker	1.52-1/2
Curb Setter	2.27-1/2
Common Laborer	1.52-1/2
Water Boy	.75
Electrician	2.73-1/2
Operator of 3 axle equip.	1.95

In conformity with the provisions of the Labor Laws of the Commonwealth of Massachusetts, the minimum wages for a day's work paid to craftsmen, teamsters, mechanics and laborers shall not be less than those established by the above schedule which has been prepared by the Department of Labor & Industries, and which is included in the proposed Contract documents. The Owner and/or Architect assume no responsibility for the accuracy of the rates set forth in this schedule, and no claim for additional compensation will be considered because of any inaccuracy in the rates set forth herein.

DIVISION I

DAM

1-1 GENERAL

The General Conditions of the General Contract Specifications apply to all work done under this contract and are hereby made a part of this specification.

1-2 SCOPE

The work to be done under this division of the Specifications includes the furnishing of all equipment, material and labor for the preparation of the foundation of the dam by removing all silt and unsuitable material to provide a proper base of suitable material, the construction of the reinforced concrete flume, the construction of the earth dam from material on the site, the construction of two reinforced spillway channels, the installation of chlorination lines, heads, etc. The construction of the gravel drive across the top of dam including bridges across spillway channels.

1-3 EXISTING CONDITIONS

Silt from the pond bottom including the area of the proposed dam has been removed during the past year. However, since the pond has again been flooded, care in draining the pond must be exercised to prevent the wash of silt from above the dam location into the dam foundation area and over the new sand bottom of the bathing area. The pond shall be drained through the new 16" outlet and valve in the existing dam. This contractor shall remove any and all silt washed into the area to the Engineers satisfaction before starting construction of the dam.

A section of flume foundation 55' long is now in place and shall be extended as shown on the plans.

The Owner has purchased and has available for use in the flume certain reinforcing steel a list of which is included in these specifications. This Contractor shall accept and use this steel and furnish and install the additional steel required to complete construction as shown on the drawings. Past experience indicates that the pond level may be sufficiently lowered to allow construction of the flume. The flow of water may then be diverted through the flume while the dam construction is completed.

1-4 PREPARATION OF BASE FOR DAM

The Contractor shall remove all silt, loam and unsuitable material from foundation and waste this material as directed by the Engineer. Borings indicated suitable material approximately three (3) feet below original bed of the pond. The dam shall be constructed on an undisturbed natural base.

1-5 CONCRETE FLUME

A. Materials:

a. Portland cement shall conform to ASTM Standard Specifications for Portland Cement," C-150-49 Type I.

b. Aggregates for Concrete shall conform to ASTM "Standard Specifications for Concrete Aggregates" C-33-49 or light weight aggregates C-130-42

c. Water shall be clean, and free from injurious amounts of oils, acids, alkalies, organic materials, or other deleterious substances.

d. Metal reinforcement shall be deformed bars, conforming to one of the ASTM "Standard Specifications for Billet-Steel, Rail-Steel, or Axle Steel Bars, or Cold-Drawn Steel Wire, or Welded Steel Wire Febric for Concrete Reinforcement" Numbers A-15-46, A-16-46, A-160-46, A-82-46, A-185-46.

e. Metal accessories, including spacers, chairs, ties, and other devices necessary for properly assembling, placing, spacing and supporting all reinforcement in place shall be provided. All chairs in contact with forms shall be hot-dip galvanized with rounded legs.

B. Testing and Inspection of Materials:

Tests of concrete and materials shall be made under direction of the Engineer who shall have access to all places where concrete materials are stored, proportioned or mixed. The Contractor shall assist in obtaining and storing of samples for testing. THE CONTRACTOR SHALL PAY FOR ALL TESTING.

C. Storage of Materials:

Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Any materials which have deteriorated or has been damaged shall not be used for concrete.

D. Proportioning and Mixing:

a. Job mixed concrete shall be composed of one part cement, 2 parts fine aggregate and not more than 3 parts of coarse aggregate. Mixing water shall not exceed 6 gallons per sack of cement, including the free water in the aggregates. Mixing shall be continued for at least one minute after all materials are in the mixer.

b. "Ready-mix" concrete may be used. Certificates shall be furnished by the mixing plant that the concrete has a minimum 28 day compressive strength of 3000 pounds per square inch when tested by methods described in ASTM Standard C-39-44.

E. Forms:

Forms shall conform to the shape, lines, and dimensions of members called for on plans, and shall be sufficiently substantial and tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain their position and shape and be removable without damage to the concrete. Forms for footings may be omitted when soil and workmanship permit accurate excavation to size, subject to the approval of the Engineer.

F. Reinforcement:

Reinforcement shall be free from excessive scale, rust or coatings that will reduce the bond to the concrete. Bars shall be accurately bent and placed in positions shown on drawings, securely supported and fastened, to prevent movement during placement of concrete.

a. Shop drawings shall be furnished to the Engineer for approval.

G. Depositing Concrete:

a. Soil bottoms for footings and slabs shall be approved by the Engineer before placing concrete.

b. Remove water and foreign matter from forms and excavations. Unless otherwise directed, wood forms shall be thoroughly wetted just prior to placing concrete.

c. Deposit concrete as nearly as practicable in its final position to avoid segregation due to re-handling or flowing.

d. Retempering- No concrete that has partially hardened, become contaminated for foreign materials, or has been retempered, shall be used.

e. Continuity of Placing. Concreting shall generally be carried on as a continuous operation until the placing of an individual section is completed. When construction joints are necessary they shall be made and located with the approval of the Engineer.

f. Compaction. Concrete shall be thoroughly compacted by suitable means during placement, and shall be carefully worked around reinforcement and embedded fixtures, along surfaces and into the corners of forms. Vibrators may be used, provided they are operated under experienced supervision and forms are constructed to withstand their action.

g. Cleaning Concrete Construction Joints. Before placing concrete adjoining construction joints in walls or slabs, the surface of the concrete already in place shall be picked brushed clean and given a coat of neat cement grout to provide a proper bond.

h. Metal form ties shall be cut off at least 3/4 inch deep in the concrete immediately after removal of forms, and holes filled with 1:3 cement and sand mortar approximately the same color as the concrete. Mortar shall be mixed and placed as dry as practicable, and finish flush with adjacent surface. No snapties shall be used.

H. Curing:

a. Protect all concrete work and cement finishes against injury from the elements and defacement of any nature during construction operations.

b. Curing. All concrete shall be maintained in a moist condition for at least the first seven days after placing. One of the following methods shall be used for curing unless another equally efficient method is approved by the Engineer.

(1) Burlap Cover. Keep the slab wet by light sprinkling for the first twelve hours, and then cover with two layers of burlap kept continuously wet for the curing period.

(2) Paper Cover Immediately following an initial 12 hours sprinkling period, the surface shall be covered with a strong kraft waterproof paper (Federal Specifications UU-1/4-147 Type IV Class C), with perimeter edges carefully lapped and weighted, and left in place for the balance of the curing period.

J. Cold Weather Requirement;

Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing or near freezing weather. Concrete materials and reinforcement, forms fillers and ground with which the concrete is to come in contact, shall be free from frost. Whenever the temperature of the surrounding air is below 40°F., concrete shall have a temperature of between 60°F and 90°F when placed inthe forms, and shall be maintained at a temperature of not less than 50°F for at least 72 hours or for as much more time as is necessary to insure a proper rate of curing of the concrete. The covering protection used in connection with curing shall remain in place, and intact, at least 24 hours after artificial heating is discontinued.

K. General requirements;

The contractor shall furnish and install all concrete, forms, reinforcing steel and related items required to complete the work indicated on the drawings and specified herein. Flume walls may be built in sections as approved by the Engineer. All forms must be removed before placing and compacting adjacent fill.

1-6 EARTH DAM

A. Material;

Borings and Soil Laboratory Analysis indicate that an adequate supply of suitable material ws available on the site. Material will be selected by the Engineer and shall be deposited in accordance with his instructions.

1-7 DEPOSITING AND COMPACTION

Earth for the dam shall bedeposited in 8 to 10 inch layers and thoroughly compacted with at least 8 passes of equipment to the Engineer's satisfaction. At the time of placing, the soil shall have a water content of 12-16% and shall attain a dry unit weight of 110 pcf. After 4 feet of fill has been placed tests will be made by the Engineer to verify water contents and unit weights and any changes in compacting procedure will be made at this time.

1-8 SPILLWAY CHANNELS

Refer to the drawings for plans and details of the reinforced concrete spillway channels. Construction shall meet all of the requirements specified herein for the concrete flume.

1-9 CHLORINATION LINES

This contractor shall furnish and install Polyethylene flexible pipe and Polystyrene fittings as indicated on the plans from outlet of chlorinizer equipment in chlorinator room to outlets in flume and lower face of dam.

This contractor shall furnish and install two 3/4"MPT cork type diffusers with silver or Uscolite injection tubes and one diffuser, channel type for 3/4" connection mounted in flume.

The complete installation shall be made in accordance with requirements of the manufacturer of chlorinizer equipment.

Chlorinizer equipment and installation in the chlorinator room will be done by others under another contractor which will be underway at the same time as this contract.

DIVISION II

GENERAL SITE WORK

2-1 GENERAL

The General Conditions of the General Contract Specifications apply to all work done under this contract and are hereby made a part of this specification.

2-2 SCOPE

Under this division of the specification the contractor shall complete all work specified herein or indicated on the plans not specifically included in any other division or not noted on the plans as being done by others. This work includes stripping, grading, seeding and sodding, driveways, parking area, concrete splash pad, cleanup of general site area, fencing etc.

2-3 STRIPPING

This contractor shall remove and stockpile where directed existing loam from areas to be disturbed during construction of the dam and bathing area. He shall strip and stockpile where directed all material unsuitable for construction of the dam which prevents access to suitable material. Such material unsuitable for dam construction may be used for grading general site areas as required but the excess of any shall be removed from the site.

2-4 GRADING

This contractor shall grade the site as indicated on the plans to required subgrades.
Subgrades shall be as follows;

Sand areas 1'0" below finish grade.
Lawn areas 4" below finish grade.
Driveways and Parking Areas 8" below finish grade.

All areas from which material for construction of the dam is taken shall be graded to uniform slopes not exceeding 3:1 and in a manner to provide proper and adequate drainage to the satisfaction of the Engineer. Such areas unless specifically otherwise designated on the plans shall become lawn areas.

2-5 SEEDING AND SODDING

All areas designated on the plans and other areas where cover is disturbed during construction of the work not specifically designated as other than lawn areas shall be treated as lawn areas and shall be sodded or seeded as required herein.

The top of the new dam as designated on the plans and all areas having a slope 2:1 or greater shall be sodded. Remaining lawn areas shall be seeded.

Sod shall be established loam sod, strongly rooted and free of all weeds and unsuitable grasses. It shall be mowed before lifting and have not less than one inch of soil,

Subgrade shall be established at four inches below finish grade and lime shall be applied at the rate of 50 pounds to 1000 square feet.

Topsoil shall be spread and lightly compacted to within the thickness of the sod and finished grade. No top soil shall be spread in a frozen or muddy condition.

Sod shall be laid so that no void occurs and shall be tamped or rolled. Screened top soil shall be brushed or raked over the sod area and shall include commercial fertilizer at the rate of 50 pounds to 1000 square feet. Sod shall then be thoroughly watered. The completed sod surface shall be true to finish grade even and firm at all points.

Sod on slopes steeper than 2-1/2 to 1 shall be held in place by wooden pins approximately one inch square and six inches long driven through the sod into the soil until they are flush with the top of the sod.

Soil for lawn areas will consist of loam stripped and stocked under the contract, loam stripped and stockpiled under previous contracts. It is understood that sufficient loam to complete required work exists within the limits of Szot Park and that the contractor will not be required to bring loam to the job from outside the Park limits without additional compensation.

Lime shall be applied to the sub-surface of lawn areas at the rate of 50 pounds to 1000 square feet. Sub-grade soil shall be loosened and mixed to a depth of 2 to 4 inches and all stones over 2 inches in size, sticks and rubbish removed. No heavy objects except lawn rollers shall be moved over lawn areas after the sub-grade soil has been prepared unless the sub-grade soil is again graded and loosened as specified above before topsoil is spread. After the sub-grade soil has been prepared, topsoil shall be spread evenly thereon and lightly compacted. No topsoil shall be spread in a frozen or muddy condition. Topsoil shall be brought to finish grade. Allowance for settlement shall be made.

Commercial Fertilizer shall be applied to the lawn areas at the rate of 50 pounds to 1000 square feet. Fertilizer may be applied with seed.

Grass seed shall be of last year's crop available and shall be a mixture of the following kinds in the percentage indicated. The mixture shall not contain over 0.05% weed seeds or 3% inert matter.....

Proportion by Weight	Kind of Seed	Purity	Germination
50%	Chewings N.Z. Fescue or Illahee Creeping Fescue	98	85
20%	Kentucky Blue	87	85
30%	Common Ryegrass	90	90

Any soil, manure, peat or similar material which has been brought onto areas other than lawn areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean at all times. Upon completion of planting all excess soil, stones, and debris which has not previously been cleaned up shall be removed from the site or disposed of as directed by the Engineer.

Lawns shall be protected and maintained by watering, mowing and replanting for at least 60 days and as much longer as is necessary to establish a uniform stand of the specified grasses and until acceptance.

2-6 DRIVEWAYS AND PARKING AREAS

This contractor shall build all driveways and parking areas as shown on the plans. Sub-grade shall be prepared to line and grade 8" below finish grade. 8" of bank gravel meeting the Engineers requirements and having his approval shall be placed graded and rolled to finish elevations and sections. Gravel shall have no stone greater than 4 inches in cross section. Place 1/2 inch of stone dust on top of gravel, mix thoroughly with upper one or two inches of gravd, wet thoroughly and reroll with heavy roller. Furnish and install drain inlets drain piping headwalls and splash pads as detailed on the plans.

2-7 FENCING

This contractor shall furnish and install a six foot high chain link fence where indicated on the site plan. Posts shall be 10'1" on centers. Line posts shall be 2-1/4" H columns, weighing 4.1# per foot. End, corner, and pull posts shall be 3" diameter 5179# per foot. Corner braus shall be 1-5/8" diameter 2.27# per foot and 3/8" round rod trusses with turnbuckles. Top rail shall be 1-5/8" diameter 2.27# per foot. Bottom rail shall be 1-1/2" H beam 2.27# per foot. Fabric shall be 2" mesh - 9 gauge. Gate shall be 10' double swinging,with 3" diameter 5.79# per foot gate posts and 2" diameter gate frame with 3/8" truss rod cross braces. Fabric shall match fence. Gates shall be complete with hinges, locking device and hold backs. Posts shall be set 2'6" in 3'0" deep 12" round 2500# concrete foundation crown top of foundation concrete to shed water.

Mesh shall be barbed at bottom and knuckled over at top and set level with top rail.

All material shall be hot dipped galvanized or heavily zinc coated after fabrication. Steel wire and steel pipe shall be copper bearing complete with all necessary fittings. All materials shall meet or better A.S.T.M. specification and shall be installed in complete accordance with manufacturer's recommendations regarding installation, materials and expansion.

2-8 CITY WATER EXTENSION TO POND

This Contractor shall excavate and backfill a trench from the Chlorinator room to the shore of the pond as shown on the plans. Trench shall be 5'0" deep. In this trench the plumbing contractor under another contract running concurrently with this contract will lay a 6" water main and install a valve and hydrant. This Contractor shall coordinate his work with that of said plumbing contractor and work in conjunction with him to complete the installation under the plumbing contractor's supervision and to meet his requirements.

This Contractor shall construct a 6" concrete splash pad as shown on the drawings in the location of the hydrant.

2-9 CLEANUP

On completion of the work under this contract and prior to acceptance by the Onwer this Contractor shall clean the entire area removing all paper, rubbish, debris, unused materials, etc. to the Engineer's satisfaction.

CONSTRUCTION OF DAM AND BATHING AREA

at

BEMIS POND, SZOT PARK

****

CHICOPEE, MASSACHUSETTS

MAYOR WALTER J. TRYBULSKI

CHICOPEE PARK COMMISSION

ARTHUR D. MAROTTE, CHAIRMAN

ANTHONY J. BEDNARZ — ROLAND L. HENAULT

WILLIAM T. BLANCHARD — JOHN S. LASKOWSKI

JOSEPH PRESTON, SUPERINTENDENT OF PARKS

****

GORON E. MACNEILL ASSOCIATES, CONSULTING ENGINEERS

JOSEPH C. GRAY, A.I.A., A.I.P., ARCHITECT AND CITY PLANNER

GOLDBERG LEMESSURIER ASSOCIATES

STRUCTURAL ENGINEERS

****

February, 1954

HAMPDEN COUNTY
APPROVED
MAR 24 1954

County Commissioners

PART ONE

SECTION A.

Instructions to Bidders
Proposal Form for General Bidders
Certificate as to Corporate Bidder
Affidavit
Contract

SECTION B.

General Scope of Work

PART TWO

Division I. Dam

Division II. General Site Work

SECTION A

INSTRUCTIONS TO BIDDERS

1. TITLE OF PROJECT

DAM AND BATHING AREA, BEMIS POND, SZOT PARK, CHICOPEE, MASSACHUSETTS
Gordon E. MacNeill Associates, Consulting Engineers

2. SCOPE OF BID

The Board of Park Commissioners of the City of Chicopee, Massachusetts, (hereinafter called the "Owner") invites bids for the construction of a dam and bathing area at Bemis Pond, Szot Park, Chicopee, Massachusetts

3. SUBMISSION OF GENERAL BIDS

Sealed bids from general bidders will be received at the office of the Board of Park Commissioners, City Hall, Chicopee, Massachusetts

until 7:30 P.M. (E.S.T.) March 9, 1954

and at that place and time will be publicly opened and read.

The bidders shall submit his bid for the project in a sealed envelope bearing on the outside the name of the bidder, his address, and the title of the project for which the bid is submitted. (If forwarded by mail the sealed envelope containing the bid, and marked as directed above, must be enclosed in another envelope addressed to the Board of Park Commissioners at City Hall, Chicopee, Massachusetts, preferably by registered mail.)

4. BID PREPARATION

Each general bidder shall make an initial deposit by registered check payable to the City of Chicopee, or cash, with the Board of Park Commissioners, City Hall, Chicopee, Massachusetts or with Gordon E. MacNeill Associates, Consulting Engineers, 561 Boylston, Street, Boston, Massachusetts in the amount of twenty five ($25.00) to receive one complete set of drawings and specifications for the project. All copies of drawings, specifications and addenda are the property of the consulting engineer and shall be returned within ten (10) days after the opening of bids. The initial deposit will be refunded only if the documents are returned in good condition.

Bidders shall thoroughly familiarize themselves with the drawings and specifications and shall visit the project site and carefully examine it and familiarize themselves with existing conditions. Existing elevations, locations, and conditions mentioned in the specifications or indicated on the drawings are given for general

information only and are not guaranteed by the owner. The bidder will be required to meet conditions as they exist and complete work indicated on drawings or called for in specifications at his own expense and without extra cost to the owner.

5. BONDS

The following bonds will be required:

A. Proposal Guaranty for General Bid. A proposal guaranty in the form of cash, a certified check, or a bid bond, in the amount of three per cent (3%) of the amount of each bid. This guaranty shall be payable to the City of Chicopee and shall be submitted by each general bidder with each of his bids.

This guaranty will be returned to all but the three lowest responsible and eligible bidders within ten days after the opening of bids, and to the remainder after the contract has been executed or, in case of the rejection of all bids, within thirty (30) days after the opening of bids. Should any bidder on the proposed work to whom an award is made fail to enter into the contract therefor within ten (10) days after notice of award has been mailed or delivered to him, the amount so received from such bidder through his cash or certified check or bid bond shall become and be the property of the City of Chicopee as liquidated damages.

B. Performance Bond for General Bid. A performance bond in the amount of one hundred per cent (100%) of the contract price, with a surety company approved by the Owner, will be required of the successful bidder. The cost of this bond is to be paid by the bidder.

C. Bidders are referred to the General Conditions for supplementary data on bonds and insurance.

6. BIDDING PROCEDURE

Bidding procedure shall be in accordance with the laws (Ter.Ed.) Chapter 149, Sections 44A through 44D, both inclusive.

A. The bidding procedure shall be as follows:

(a) Bids from general contractors shall be for the complete project as specified and the general contractor shall be selected on the basis of such bid.

7. ADDENDA

If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of the plans, specifications or other proposed contract documents, he may submit to the Consulting Engineer a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any

interpretation of, or addition to, the proposed documents will be made only by Addendum duly issued and a copy of such Addendum will be mailed or delivered to each person receiving a set of documents. The engineer will not be responsible for any other explanation or interpretation or additions. All Addenda to bidders are to be incorporated in the proposal and will become part of the contract documents.

9. BID FORMS

Bidders are required to make their proposals in their pertinent form of the Proposal Form for General Bidders, copies of which are included in this Section.

The proposal must bear the written signature of the bidder. If the bidder is an individual doing business under a name other than his own name, the proposal must so state, giving the address of the individual. If the bidder is a partnership, the proposal must so state, setting forth the names and addresses of all partners and must be signed by a partner designated as such. If the bidder is a corporation, the proposal must bear the seal of the corporation and must be signed by a duly authorized officer or agent of such corporation, and the Certificate attached to the Form of Proposal must be executed and included.

Any bid which fails to name a price, both in words and in figures, per unit for each and every item wherein quantities are given, may be held to be informal and may be rejected, and in case of any discrepancy between the price written in words and that given in figures, the price written in words will be considered as bid. No alterations, erasures, or interlineations shall be made in the bid. Conditional bids will not be accepted.

The price or prices bid for the item or several items of the work shall include and cover the cost of furnishing all materials, labor and services necessary for the performance of all work set forth, described and shown in the proposal, specifications and on the drawings for the work.

10. AWARD OF GENERAL CONTRACT

The general contract shall be awarded on the basis of competitive bids to the lowest responsible and eligible bidder within thirty (30) days of the date when the bids are opened. The Owner, as the awarding authority, reserves the right to reject any or all bids if it be in the public interest to do so.

The Owner may require the lowest bidder, and such other bidders as he may determine, to file with him a statement, sworn to by the bidder, setting forth the financial condition, present plant and equipment, working organization and prior experience of the bidder, and such other pertinent information as the Owner may deem reasonably necessary to determine the qualifications of the bidder. Such statements shall be returned to all except the successful bidder upon request. Such statement shall be for the use and information solely of the Owner.

The person or persons to whom the contract may be awarded will be required to execute the contract within ten (10) days from the date of the service of a notice to the effect that the contract has been awarded.

11. FORM OF CONTRACT

It is the intent that the contract be let on the basis of a stipulated sum.

Date of Completion of the contract for this project shall be July 1 , 1954.

The Contractor will be required to complete the entire work to the satisfaction of the Owner, and in strict accordance with the plans, specifications and the contract. No compensation beyond the amount payable for the several classes of work and materials hereinafter enumerated which shall be actually performed and furnished at the prices therefor hereinafter stated, shall be due or payable for the entire work and materials.

The Contractor shall comply with the applicable laws of the Commonwealth of Massachusetts, by-laws of the City of Chicopee, Mass., and regulations of any other appropriate authority.

PROPOSAL FORM FOR GUIDE'S BIDDER

DAM AND BATHING AREA, CHOT PARK, BEMIS POND,

To: Board of Park Commissioners
City Hall
Chicopee, Massachusetts

(a) The undersigned proposes to furnish all the labor, materials and services required for the construction of the Dam and Bathing Area at Bemis Pond, Chot Park, Chicopee, Massachusetts, in accordance with the accompanying specifications and drawings prepared by Gordon E. MacNeill Associates, Consulting Engineers, 561 Boylston Street, Boston, Massachusetts, for the sum specified below, subject to additions and deductions according to the specifications and in all respects according to the terms thereof.

(b) The undersigned agrees that if within thirty (30) days from the day named for delivering the proposal to the awarding authority, notice that this proposal will be accepted by the Owner shall be mailed to him at the business address given below, or shall be delivered to him, he will, within ten days thereafter, deliver to the Owner where directed a contract properly executed in triplicate (or otherwise) in the forms annexed with such changes therein as shall have been made by the Owner prior to the time named for delivery of this proposal, together with a bond of a surety company satisfactory to the awarding authority in the sum of one hundred (100) per cent of the contract price, the premium for which is to be paid by the contractor and is included in the contract price.

(c) The proposed contract sum is _____

_____ (dollars) ($_____).

(d) The undersigned further agrees that the certified check or bid bond or cash left with the Board of Park Commissioners shall become the property of the City of Chicopee, Mass., as liquidated damages, if, after an award is made to him, he shall fail to enter into a contract therefor within ten (10) days after notice of said award has been mailed or delivered to him.

The undersigned agrees to commence operations on the dam and bathing area within ten (10) days after being awarded a contract and to prosecute the work to completion, subject to extension of time due to delay caused by a strike or boycott for which the contractor is in no way responsible and which the contractor cannot reasonably avoid, on or before July 1, 1954.

In submitting this bid it is understood that the Owner reserves the right to reject any or all bids of the general bidder and to waive any informalities in bidding if it be in the public interest to do so. It is also agreed that this bid may not be withdrawn prior to thirty (30) days from the date of the opening of the bids without the consent of the Owner.

The undersigned states that he has received Addenda numbered _____.

Bidder:

By:

Business Address:

Date:

The bidder is a _____
Individual-Partnership-Corporation

The full names and addresses of all persons interested in this proposal, as principals, are as follows:

Individual Owner:

State full name and address of Owner. If business is carried on in any other name than that of the Owner, state such name and address:

Partnership:

State full name and address of all partners.

Corporation:

Corporation is incorporated in the State of

President is

Treasurer is

Place of business is

Note: This proposal must bear the written signature of the bidder.

If the bidder is an individual doing business under a name other than his own name, the proposal must so state giving the address of the individual.

If the bidder is a partnership, the proposal must state, setting forth the names and addresses of all partners and must be signed by a partner designated as such.

If the bidder is a corporation, the proposal must bear the seal of the corporation and must be signed by a duly authorized officer or agent of such corporation.

CERTIFICATE AS TO CORPORATE BIDDER

I, _____, certify that I am the _____ of the corporation named as a Bidder in the within Bid Form; that _____ _____, who signed said Bid Form on behalf of the Bidder was then _____ of said corporation; that I know his signature; that his signature thereto is genuine and that said Bid Form was duly signed, sealed and executed for and in behalf of said corporation by authority of its governing body.

(CORPORATE SEAL)

_____
Secretary - Clerk

Dated: _____

AFFIDAVIT

State of _____)
)
County of _____)

_____, being first duly sworn, deposed and says:

That he is _____

(insert in line above your position as partner or officer and name of partnership or corporation), the party making the foregoing proposal or bid, that such bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived, or agreed directly or indirectly with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly, sought by agreement or collusion, or communication or conference, with any person, to fix the bid price of affiant or any other bidder, or to fix any overhead, profit, or cost element of said bid price, or that of any other bidder, or to secure any advantage against the City of Chicago or any person interested in the proposed contract; and that all statements contained in said proposal or bid are true.

_____
(Name of bidder if the bidder is an individual)
(Name of partner if the bidder is a partnership)
(Name of officer if the bidder is a corporation)

Subscribed and sworn to this

_____ day of _____

_____
Notary Public

My Commission expires _____

CITY OF CHICOPEE, MASS.

BOARD OF PARK COMMISSIONERS

CONTRACT

for

CONSTRUCTION OF A DAM AND BATHING AREA AT BEKIS POND

THIS AGREEMENT, made and entered into this _____ day of _____ A.D. 19[illegible], by and between the City of Chicopee, Massachusetts, through its Board of Park Commissioners, duly authorized in the premises and acting solely for the City of Chicopee and without personal liability, either individually or collectively, party of the first part, and

_____ with legal address and principal place of business at _____

hereinafter designated as the Contractor, party of the second part:

WITNESSETH: That the parties to these presents, each in consideration of the undertakings, promises and agreements on the part of the other herein contained, have undertaken, promised and agreed, and do hereby undertake, promise and agree, the party of the first part for himself and for his successors and assigns, and the party of the second part for themselves and for their heirs, executors, administrators, successors and assigns, as follows:

Article I. Wherever the words defined in this article, or pronouns used in their stead, occur in this contract, and the specifications hereto attached, they shall have the meanings given. Definitions

The word "Commission" shall mean the Board of Park Commissioners, of the City of Chicopee, Mass., or any agent or officer duly authorized to act in its behalf in the execution of the work required by this contract.

The word 'Engineer' shall mean any person designated by the Board of Park Commissioners of the City of Chickasaw, acting directly or through properly authorized agent, such agents acting within the scope of the particular duties entrusted to them.

The word 'Contractor' shall mean the party of the second part, above designated, entering into this contract for the performance of the work required by it and the legal representatives of said party, or the agent appointed to act for said party in the performance of the work.

The word 'Contract' shall mean, collectively, all of the covenants terms and stipulations in these articles of agreement, and in the supplementary documents hereto attached which constitute essential parts of the agreement, and are hereby made such parts thereof, to wit:

Advertisement
Instructions to Bidders
Proposal Forms
Contract
Specifications
Contract Drawings

The word 'Specifications' shall mean collectively all of the terms and stipulations contained in the general and detailed specifications appended to this agreement.

The words 'Contract Drawings' shall mean the drawings hereto attached, together with such supplementary drawings as may be issued or approved by the Engineer from time to time as herein elsewhere provided.

Wherever in the Specifications or on the contract drawings the words directed, required, permitted, ordered, instructed, designated, prescribed, considered necessary, or words of like import are used, it shall be understood that the direction, requirement, permission, order, instruction, designation, prescription or decision of the Engineer is intended; and similarly the words approved, acceptable, satisfactory, or words of like import, shall mean approved by, or acceptable or satisfactory to the Engineer, unless another meaning is plainly intended.

Work to be done.

Article II. The contractor shall do all the work and furnish all the materials, tools, labor and equipment necessary, proper and incidental to the construction of the dam and batuing area and required by the contract, in the manner, within the time, and for the consideration herein stipulated and agreed upon.

Engineer to decide.

Article III. All the work under this contract shall be done to the satisfaction of the Engineer, who shall in all cases determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for hereunder and shall decide all questions which may arise as to measurement of quantities and the fulfillment of the conditions of this contract on the part....

of the Contractor, and his determination and decision thereon shall be final and conclusive and such determination and decision, in case any question shall arise, shall be a condition precedent to the right of the Contractor to receive any money hereunder.

Work to be done in accordance with drawings and specifications

Article IV. The work during its progress and upon its completion must conform with the Contract Drawings and Specifications, and with other directions of the Engineer, as given from time to time during the progress of the work, under the terms of this contract; in no case shall any work in excess of the requirements of the drawings be paid for unless authorized in writing by the Engineer or his agents especially authorized thereto.

Time and manner of doing work.

Article V. The Contractor shall commence the work after the contract has been executed by the City and upon notice from the Board of Park Commissioners or Engineer signifying that the work must be started.

The Contractor shall prosecute the work as directed by the Engineer until completion.

The Date of Completion shall be the date of the final estimate prepared under the conditions herein specified.

The Contractor shall commence the work at such points and shall thereafter continue at such points and in such order or precedence as the Engineer may approve.

Extension of time

Article VI. If the Contractor is obstructed or delayed in the prosecution or completion of the work by any damage that may happen thereto by the unusual action of the elements, or by the abandonment of the work by the Employees in a general strike, the Contractor shall have no claim for damage for any such cause or delay, but he shall in such case be entitled to such extension of time specified herein for the completion of the work as the Engineer shall in writing certify to be just and proper; provided, however, that claim for such extension of time is made by the Contractor in writing within one (1) month from the time when such alleged cause for delay shall occur.

Drawings and Specifications mutually explanatory

Article VII. The Contract Drawings and Specifications are intended to be explanatory of each other, but should any discrepancy appear or any misunderstanding arise as to the import of anything contained in either, the explanation of the Engineer shall, in all cases, be final and binding upon the Contractor. Any corrections of errors or ommissions in the Drawings and Specifications may be made by the Engineer when such correction is necessary for the proper fulfillment of their intention as determined by him.

Changes

Article VIII. This contract and the specifications herein contained and the drawings herein referred to, may be changed from time to time as may be agreed in writing between the parties hereto, in a manner notmaterially affecting the substance thereof nor materially increasing the amount to be paid, in order to carry out and complete more fully and perfectly the work herein agreed to be done and performed.

Article IX. In case work other than that specified shall be found necessary, the Contractor shall perform the whole or such portion of such work as the Engineer may require, and agrees to accept as full compensation for such extra work the actual and necessary net cost of the work as determined by the Engineer, plus fifteen (15) per cent, of such cost. Such actual net cost shall cover all labor and materials necessary for the performance of the extra work, including any extraordinary expenses incurred directly on account thereof, the wages of foreman and the expense attached to the Contractor's liability insurance covering the labor so employed. In computing such net cost, however, no interest, rent or depreciation of plant, nor services of a general superintendent or administrative force shall be included; the allowance of fifteen (15) per cent shall include all such expense for superintendence, administration, interest, rent depreciation, general expenses of plant and contingencies; and shall include all profit. The Contractor shall, before the tenth day of the month succeeding that in which any extra work shall have been performed, file with the Engineer an account giving the itemized cost of such extra work, and shall give the Engineer access to all accounts, bills and vouchers relating thereto. In case the Contractor fails to file, at the time above mentioned, such account for extra work, he shall have no claim for compensation for the same against the Commission, over and above the allowance certified by the Engineer. No extra work will be paid for unless ordered in writing by the Engineer.

Contractor's claims for damage.

Article X If the Contractor claims compensation for any damage alleged to have been sustained by reason of any act or omission of the Commission or any of its agents, he shall, within one (1) week after the sustaining of such damage, make a written statement to the Commission of the nature of the damage sustained, and shall, on or before the fifteenth (15th) day of the month succeeding that in which any such damage shall have been sustained, file with the Engineer an itemized statement of the details and amounts of such damage, and unless such statements shall be made as so required, his claim for compensation shall be forfeited and invalid, and he shall not be entitled to payment for any damage.

Article XI. The Contractor shall keep the work under his personal control, and shall not assign, transfer, convey, sublet or otherwise dispose of this contract, or his right, title or interest in or to the same or any part thereof, without the previous consent in writing of the Commission, and he shall not assign, by Power of Attorney or otherwise, any of the moneys to become due and payable under this contract, unless by and with the like consent of the Commission; provided that nothing herein contained shall be construed or hinder, prevent, or affect an assignment by the Contractor for the benefit of his creditors, made pursuant to existing statutes of the Commonwealth of Massachusetts.

Not to sublet or assign.

Article XII. The Contractor shall give his personal attention constantly to the faithful prosecution of the work, and shall be present, either in person or by a duly authorized representative, on the site of the work, continually during its progress; such representative shall have authority to receive and to act without delay upon all instructions of the Engineer or his assistants in the prosecution of the work in conformity with this contract.

Representative on work.

Article XIII. The Commission and the Engineer and other agents and employees of the Commission may for any purpose, and its other contractors may for all purposes required by their contract, enter upon the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefor. Any differences or conflicts which may arise between the Contractor and other contractors or agents of the Commission in regard to their work shall be adjusted and determined by the Engineer.

Furthermore, the Commission and the Engineer and their assistants and agents shall, at all times, have access to all places where materials are being prepared for use under this contract, and shall have full facilities for unrestricted inspection of such materials.

Access to work and to placed of manufacture.

Article XIV. The contractor shall provide the services and equipment of competent personnel to provide lines and grades for the work and shall be responsible for their accuracy.

Lines and grades.

Article XV. Whenever the Constractor is not present on any part of the work where it may be desired to give directions, orders may be given by the Engineer and shall be received and obeyed by the Superintendent or foreman who may have charge of the particular work upon which the orders are given.

Orders

Article XVI. The Contractor shall employ only competent and skillful mento do the work, and whenever the Engineer shall notify the Contractor, in writing, that any man on the work is, in his opinion, incompetent, unfaithful or disorderly, or in any other way unsatisfactory, such man shall be discharged from the work and not again employed on it except with the consent of the Engineer

Competent help to be employed.

Regulations Laws and Ordinances

Article XVII. The Contractor shall keep himself fully informed of all laws, ordinances and regulations in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency shall be discovered in this contract, or in the drawings or specifications herein referred to, in relation to any such law, ordinance, regulation, order, or decree, he shall forthwith report the same in writing to the Engineer. He shall at all times himself observe and comply with, and shall cause all his agents and employees to observe and comply with all such existing and future laws, ordinances, regulations, orders and decrees; and shall protect and indemnify the Commission and its officers and agents against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree, whether by himself or by his employees.

Right of property in materials

Article XVIII. Nothing in the contract shall be considered as vesting in the Contractor any right of property in materials used, after they shall have been attached or affixed to the work or soil, nor in materials which have been estimated for partial payment, but all such materials shall, upon being so attached or affixed, or estimated, become the property of the Commission.

Defective work

Article XIX. Inspection of the work shall not relieve the Contractor from any of his obligations to fulfill the contract as herein described, and defective work shall be made good, and unsuitable materials may be rejected, notwithstanding that such work or materials may have been previously overlooked by the Engineer and accepted or estimated for payment. If the work or any part thereof shall be found defective at any time before the final acceptance of the whole work, the Contractor shall forthwith make good such defect in a manner satisfactory to the Engineer, and if any material brought upon the ground for use in the work, or selected therefor, shall be condemned by the Engineer as unsuitable or not in conformity with the specifications, the Contractor shall forthwith move such material from the vicinity of the work. If the Contractor shall fail to remove or replace any defective or damaged materials or work after reasonable notice, the Engineer may cause such materials or work to be removed or replaced, and the expense thereof shall be borne by the Contractor.

Article XX. If the work to be done under this contract shall be abandoned, or if this contract shall be sublet or the contract or any claim thereunder shall be assigned by the Contractor otherwise than as heretofore specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing to the Commission, that the conditions herein as to the rate of progress are not fulfilled or that the work, or any part thereof, is unnecessarily or unreasonably delayed, or the Contractor is violating any of the provisions of this contract, that Commission may notify the Contractor to discontinue all work, or any part thereof, and thereupon the Contractor shall discontinue such work or such part thereof as the Commission may designate, and the Commission may thereupon, by contract or otherwise, as it may determine, complete the work, or such part thereof, and charge the expense thereof to the Contractor, and may take possession of and use therein such materials, animals, machinery, equipment, implements and tools of every description as may be found upon the site of said work. The expenses so charged shall be deducted and paid by the Commission out of any or any part of money then due or to become due the Contractor under this contract, or any part thereof; and in case such expense is less than the sum which would have been payable under this contract if the same had been completed by the Contractor, the Contractor shall be entitled to receive the difference; and in case such expense shall exceed that latter sum the Contractor, or in case of his default, his surety, shall pay the amount of such excess to the City of Chicopee.

Conditions under which the Commission may complete the work

Article XXI. The Contractor shall take all responsibility of the work and shall take precautions for preventing injuries to persons and property in or about the work; shall bear all losses resulting to him on account of the nature of the land in or on which the work is done if different from what was estimated or expected, or on account of the weather, elements or other causes; shall cover and protect the work from damage by flood or front action, and all injury to the same before the completion of the contract shall be made good by him; and he shall assume the defense of and indemnify and save harmless the Commission from all claims, likewise each member of the Commission and its officers and agents, relating to labor or materials furnished for the work; to inventions, patents and patent rights used in the work or in doing the work; to injuries to any person or corporation received or sustained by any act of the Contractor orhis employees in doing the work, or in consequence of any improopermaterials, implements or labor used therein; and to any act, omission or neglect of the Contractor and his employees therein.

Responsibility Of Contractors Indemnity etc.

Article XXII. The Commission may keep any moneys which would otherwise be payable at any time hereunder, and apply the same, or so much as may be necessary therefor, to the payment of any expenses, losses or damages incurred by the Commission and determined as herein provided, and may retain until all claims are settled so much of the moneys as the Commission shall be of the opinion will be required to settle all claims of the nature specified in Article XXI against the Commission and its officers and agents, and all claims for labor or materials for the work, notice of which, signed and sworn to be the claimants, shall have been filed in the office of the Commission. The Commission may also with the written consent of the Contractor, use any money retained, due or to become due under this contract, for the purpose ofpaying for labor or materials for the work. Money may be retained.

Article XXIII. The Commission shall pay and the Contractor shall accept as full compensation for everything furnished and done by the Contractor under this contract, and also for all loss or damage arising out of the nature of the work aforesaid, or from the action of the elements, or from any unforeseen obstruction or difficulty encountered in the prosecution of the work, and for all rights of every description connected with the work, and for all expenses incurred by or in the consequence of the suspension of discontinuance of the work as herein specified, and for well and faithfully completing the work, and the whole thereof, as herein provided, the sum of Price of work.

Article XXIV. In order to assist the Contractor to prosecute the work advantageously, the Engineer shall, from time to time during the active progress of the work and generally once each month, make in writing an estimate, such as in his opinion shall be just and fair, of the amount of work done to the time of such estimate and the value thereof in accordance with the terms of the contract. Partial estimates and payments.

Upon such partial estimate being made and certified in writing to the Commission, the Commission shall retain ten (10) per cent, of the total estimated valuation as part security for the fulfillment of the contract on the part of the Contractor, and shall pay to the Contractor prior to the fifteenth day of the month after the date of the estimate the balance not retained as aforesaid after deducting therefrom all previous payments and all amounts to be kept or retained under the provisions of this contract or as may be authorized or required by any law of the Commonwealth of Massachusetts.

Payments may at any time be withheld if the work is not proceeding in accordance with the contract, and at the option of the Commission estimates may be made more frequently and a smaller amount may be retained than as aforesaid.

Article XXV. Whenever in the opinion of the Engineer the Contractor shall have completely performed the contract on his part, the Engineer shall so certify in writing to the Commission and shall submit a final estimate of the total amount of work done by the Contractor, and of the value of such work under and according to the terms of this contract. Upon the expiration of thirty (30) days after the date of acceptance of the work by the Commission, the Commission shall pay to the Contractor the entire sum so found to be due hereunder, after deducting therefrom all previous and all amounts to be kept or retained under the provisions of this contract. Final estimate and payment

All prior partial estimates and payments shall be subject to correction in the final estimate and payment; the final estimate and the measurements upon which it is based may be made without notice thereof to the Contractor.

Article XXVI. Neither the acceptance of the Commission or its Engineer, or any of its employees, nor any order, measurement or certificate by the Engineer, nor any order by the Commission for payment of money, nor any payment for, nor acceptance of the whole or any part of the work by the Engineer or the Commission, nor any extension of time, nor any possession taken by the Commission or its employees, shall operate as a waiver of any portion of this contract or of any power herein reserved to the Commission, or of any right to damages herein provided; nor shall any waiver of any breach of this contract be held to be a waiver of any other or subsequent breach. All remedies provided in this contract shall be taken and construed as cumulative; that is, in addition to each and every other remedy herein provided. Waivers

Article XXVII. No person, firm or corporation, other than the signer of this contract as Contractor, now has any interest hereunder, and no claim shall be made or be valid, and neither the Commission nor any of its agents shall be liable for or be held to pay any money, except as provided in Articles VIII, IX, X, XXIII, XXIV, and XXV. The acceptance by the Contractor of the final payment aforesaid shall operate as, and shall be, a release to the Commission and its agents, from all claim and liability to the Contractor for anything done or furnished for, or relating to, the work or for any act or neglect of the commission or of any person relating to or affecting the work. Final payment to terminate liability of commission.

Article XXVIII. Public Employee May Select Lodging: Every employee in public work shall lodge, board and trade where and with whom he elects; and no person or his agents or employees under contract with the Commonwealth, a county, city or town, or with a department, board commission or officer acting therefor, for the doing of public work shall directly or indirectly require, as a condition of employment therein, that the employee shall lodge, board or trade at a particular place or with a particular person, and all as provided in Chapter 149, Section 25, of the General Laws, as amended.

which said Chapter and Section are made a part hereof as if at length set forth herein.

Article XXXIII. Performance Bond: The Contractor shall furnish to the City bond of security, in an amount equal in full to the sum payable of all the terms and conditions of the CONTRACT, and the payment of all obligations arising thereunder, and as required by the Charter of the City of Chicopee as set forth in the Acts of 1897, Chapter 239, Section 88, as amended, which said Chapter and Section are made a part hereof as if at length set forth herein, and the premium for such bond shall be paid by the Contractor.

The Performance and Labor and Material Bonds may be made up in one instrument.

Article XXXIV. In doing the contemplated work under this contract, preference shall be given to citizens of Chicopee.

Article XXXV. Both the address given in the bid or proposal upon which this contract is founded and the Contractor's office at or near the site of the work are hereby designated as places to either of which notices, letters and other communications to the Contractor shall be mailed or delivered. The delivering at either of the above named places, or depositing in a postpaid wrapper directed to the first named place, in any Post Office box regularly maintained by the Post Office, of any notice, letter or other communication to the Contractor, shall be deemed sufficient service thereof upon the Contractor and the date of said service shall be the date of such delivery or mailing. The first named address may be changed at any time by an instrument in writing executed and acknowledged by the Contractor and delivered to the Commission. Nothing herein contained shall be deemed to preclude or render inoperative the service of any notice, letter or other communication upon the Contractor personally.

Article XXIX. Preference to Veterans and Citizens: In the employment of mechanics, teamsters, chauffeurs and laborers in the construction of public works by the Commonwealth, or by a county, town or district, or by persons contracting, or sub-contracting for such works, preference shall first be given to citizens of the Commonwealth who have served in the Army or Navy of the United States in time of war and have been honorably discharged therefrom or released from active duty therein, and who are qualified to perform the work to which employment relates; and secondly, to citizens of the Commonwealth generally, and, if they cannot be obtained in sufficient numbers, then to citizens of the United States, and all as required by the General Laws, Chapter 149, Section 26, as amended, which said Chapter and Section are made a part hereof as if at length set forth herein.

Article XXX. Hours and Days of Employment: With regard to the persons in his employ, the Contractor shall comply with the provisions of General Laws, Chapter 149, Section 34, as amended, which reads as follows:

"Every contract, except for the purchase of material or supplies, involving the employment of laborers, workmen or mechanics, foremen or inspectors, to which the Commonwealth or any county or any town, subject to Section 30 is a party, shall contain a stipulation that no laborers, workmen, or mechanic, foreman or inspector, working within the Commonwealth, in the employ of the contractor, sub-contractor or other person doing or contracting to do the whole or part of the work contemplated by the contract, shall be required or permitted to work more than eight hours in any one day or more than forty eight hours in any one week, or more than six days in any one week, except in cases of emergency, or in case any town subject to Section 31 is a party to such a contract, more than eight hours in any one day, except as aforesaid; provided that in contracts entered into the Department of Public Works for the construction or reconstruction of highways there maybe inserted in said stipulations a provision that said department, or any contractor or sub-contractor for said department, may employ laborers, workmen, mechanics foremen and inspectors, for more than eight hours in any one day in such construction or reconstruction when, in the opinion of the Commissioner of Labor and Industries public necessity so requires. Every such contract not containing the aforesaid shall be null and void."

ArticleXXXI. Workmen's Compensation: The Contractor shall before commencing performance of the Contract herein entered into, provide by insurance for the payment of compensation and the furnishing of other benefits under General Laws, Chapter 149, Section 34A, as amended, to all persons being employed under the Contract and the Contractor shall continue such insurance in full force and effect during the term of the within contract, as required by General Laws, Chapter 149, Section 34A, as amended, which said Chapter and Section are made a part hereof as if at length set forth herein.

IN WITNESS WHEREOF, on the day and year first above written, the City of Chicopee has caused its corporate seal to be hereto affixed, and these presents to be signed in its name and behalf by its BOARD OF PARK COMMISSIONERS, and

hereunto set their individual hands and seals, this being one of four counter-part originals of the within agreement, all being executed as aforesaid, and constituting together one and the same agreement.

CITY OF CHICOPEE

Approved:

MAYOR

BOARD OF PARK COMMISSIONERS

Approved as to form

City Solicitor

COMMONWEALTH OF MASSACHUSETTS

Hampden, ss. Chicopee, _____ A.D. 1954

Then personally appeared above named , known to me, and made oath that he, the said . and the duly appointed and qualified members of the BOARD OF PARK COMMISSIONERS of the City of Chicopee, and that each of them subscribed his name to the foregoing instrument, in execution of such instrument, in accordance with the authority of law conferred upon them, before me,

_____
Notary Public (SEAL)

Commission expires _____

COMMONWEALTH OF MASSACHUSETTS

, ss. _____, 1954

Then personally appeared the above named

known to me to be the

described in and who executed the foregoing instrument, before me,

_____
Notary Public (seal)

Commission Expires _____

I, the undersigned, the duly authorized and acting legal representative of the City of Chicopee, Massachusetts, do hereby certify as follows:

I have examined the foregoing contract and surety bond and the manner of execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed by the proper parties thereto acting through their duly authorized representative; that said representative has full power and authority to execute agreements on behalf of the respective parties named thereon; and that the foregoing agreement constitutes valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions and provision thereof.

_____

_____
(Title)

SECTION B

GENERAL SCOPE OF WORK

1. SITE

The Contractor shall accept the premises in their present condition.

2. GENERAL

Certain work in connection with the construction of the bathing area has been completed. This work has altered the existing contour as indicated on plans. Work outside the scope of this contract will be carried on simultaneously with the work under this contract. The contractor shall cooperate with other contractors and City employees to coordinate his work with theirs to ensure completion of all work in the area without unnecessary delay.

The work to be done under this contract includes all labor, materials and equipment to complete all work required for the construction of the dam and bathing area and associated facilities to complete the work shown in the drawings in strict accordance with the Drawings and Specifications, together with any Addenda which may be issued during the bidding period.

The work includes handling of sub-surface conditions which may be encountered at no additional cost to the owner.

The work also will include handling of sub-surface conditions which may be encountered at no additional cost to the owner.

The work also will include later instructions, modifications to, additions to or deletions from the contract as agreed by the Owner and the Contractor during the construction period in accordance with procedures described in these specifications.

Items of work not included in this contract but shown on the plans are noted on the drawings.

3. TESTS

The General Contractor shall assume the overall responsibility with respect to the Owner, for the performance of all tests included in the Specifications, and for the performance and costs of all tests, for which responsibility is not specifically assigned to others, required to establish the specified characteristics of all materials.

4. BONDS

Bonds will be required as called for in the Instructions to Bidders.

5. PERMITS

All building permits, certificates, and licenses shall be paid for by the Contractor.

6. TEMPORARY TOILETS

The Contractor shall provide and maintain temporary sanitary toilets adequate for the use of all employees and in conformity with the requirements of pertinent Codes and Regulations.

7. TEMPORARY WATER SUPPLY

The Contractor shall provide and pay for all water required for the construction work and shall furnish all necessary connections, equipment and labor for installing and maintaining the same, including that required for fire protection during the project work.

8. TEMPORARY LIGHT AND POWER

The Contractor shall provide and pay for all electric energy for light and power as required to complete the work of the Contract, including the labor and materials for temporary wiring, fixtures, transformers and other equipment.

9. TEMPORARY HEAT

The Contractor shall provide and pay for all special equipment and for the fuel and service for temporary heating as required for the proper protection and drying of all work. The method of providing temporary heating shall be subject to the approval of the Engineer.

10. STORAGE OF OILS AND GASOLINE

The storage on the Project site of any and all oils, gasoline, or other combustibles, shall be subject tothe requirements of pertinent authorities having jurisdiction.

11. WINTER CONDITIONS

The General Contractor shall assume responsibility with respect to the Owner for the erection and maintenance in operation of all structures and facilities required for the protection and continuance of work during winter conditions.

12. PROTECTION

Article 12, Protection of Work and Property, of the General Conditions, shall be and is supplemented as follows:

a. General: The recommendations of the Manual of Accident Prevention in Construction, latest edition, published by the Associated General Contractors of America, are hereby made a part of this specification to the extent that such recommendations are not in contravention of applicable laws.

b. Fire Protection: The Contractor shall provide and maintain in good working order under all conditions, suitable and adequate fire protection equipment and services, approved by the Clerk of the Works.

c. Watchman: The Contractor shall maintain adequate watchman services for the duration of the project and shall be responsible, with respect to the Owner, for all materials and equipment on the site. He shall make good, at his own expense, all damage or loss to the structures.

13. ENGINEER

The Contractor shall employ, within the terms of his contract, a qualified engineer, who shall lay out the site improvements, establish grades and levels and a permanent bench mark, and do the usual engineering works as required, including levelling and checking.

14. INTENT OF DOCUMENTS

It is the intent that all materials shall be furnished and all work accomplished in strict accordance with the grades of materials, standards of workmanship, and Standard Specifications listed or mentioned in the documents of the contract. Materials shall be free from defects impairing strength, durability or appearance.

The mention of any method of installation,erection, fabrication, or workmanship shall not operate to make the Contractor an agent, but shall be for the sole purpose of establishing a standard of quality.

15. SPECIFICATION ARRANGEMENT

The separation of the specifications into Divisions is for convenience of reference only and is not intended to limit or prescribe contracts between the Contractor and Sub-contractor.

16. GUARANTY-WARRANTY

The Contractor shall guarantee all work as called for in the Divisions of this specification, whether performed by himself or by his subcontractors, for one year from the date of substantial completion.

The phrase "one year from date of substantial completion" shall be interpreted to mean one year from the date of final acceptance of the entire project by the Owner.

17. SCHEDULE OF MINIMUM WAGES

The following minimum hourly wage rates have been established by the Commissioner of Labor and Industries in accordance with Chapter 149 and 461 of the General Laws of the Commonwealth of Massachusetts. They shall be kept posted in a conspicuous place through the entire time work is in progress.

OCCUPATIONS	RATE PER HOUR
Crane Operator	2.65
Power Shovel Operator	2.65
Bulldozer Operator	2.15
Compressor Operator:	
220 cu.ft. or less	1.75
Over 220 cu.ft.	2.15
Jack Hammer Operator	1.52-1/2
Roller Operator	2.15
Pumpman	2.15
Cement Finisher	2.97-1/2
Stone Mason	2.97-1/2
Mason Tender	1.52-1/2
Carpenter	2.42-1/2
Pile Driver & Cofferdam Builder	2.75
Iron Worker	3.05-1/2
Blaster	1.65
Truck Driver	1.89-1/2
Asphalt Raker	1.52-1/2
Curb Setter	2.27-1/2
Common Laborer	1.52-1/2
Water Boy	.75
Electrician	2.73-1/2
Operator of 3 axle equip.	1.55

In conformity with the provisions of the Labor Laws of the Commonwealth of Massachusetts, the minimum wages for a day's work paid to craftsmen, teamsters, mechanics and laborers shall not be less than those established by the above schedule which has been prepared by the Department of Labor & Industries, and which is included in the proposed Contract documents. The Owner and/or Architect assume no responsibility for the accuracy of the rates set forth in this schedule, and no claim for additional compensation will be considered because of any inaccuracy in the rates set forth herein.

DIVISION I

DAM

1-1 GENERAL

The General Conditions of the General Contract Specifications apply to all work done under this contract and are hereby made a part of this specification.

1-2 SCOPE

The work to be done under this division of the Specifications includes the furnishing of all equipment, material and labor for the preparation of the foundation of the dam by removing all silt and unsuitable material to provide a proper base of suitable material, the construction of the reinforced concrete flume, the construction of the earth dam from material on the site, the construction of two reinforced spillway channels, the installation of chlorination lines, heads, etc. The construction of the gravel drive across the top of dam including bridges across spillway channels.

1-3 EXISTING CONDITIONS

Silt from the pond bottom including the area of the proposed dam has been removed during the past year. However, since the pond has again been flooded, care in draining the pond must be exercised to prevent the wash of silt from above the dam location into the dam foundation area and over the new sand bottom of the bathing area. The pond shall be drained through the new 16" outlet and valve in the existing dam. This contractor shall remove any and all silt washed into the area to the Engineer's satisfaction before starting construction of the dam.

A section of flume foundation 15' long is now in place and shall be extended as shown on the plans.

The Owner will deliver at the site all reinforcing steel required for the construction of the main Flume and Spillways. This contractor shall accept delivery of the steel and install same in accordance with the drawings. Past experience indicates that the pond level may be sufficiently lowered to allow construction of the flume . The flow of water may then be diverted through the flume while the dam construction is completed.

1-4 PREPARATION OF BASE FOR DAM

The Contractor shall remove all silt, loam and unsuitable material from foundation and waste this material as directed by the Engineer. Borings indicate suitable material approximately three (3) feet below original bed of the pond. The dam shall be constructed on undisturbed natural base.

1-5 CONCRETE FILLER

A. Materials:

a. Portland cement shall conform to ASTM Standard Specifications for Portland Cement," C-150-49 Type I.

b. Aggregates for Concrete shall conform to ASTM "Standard Specifications for Concrete Aggregates" C-33-49 or light weight aggregates C-130-48

c. Water shall be clean, and free from injurious amounts of oils, acids, alkalies, organic materials, or other deleterious substances.

d. Metal reinforcement shall be deformed bars, conforming to one of the ASTM "Standard Specifications for Billet-Steel, Rail-Steel, or Axle Steel Bars, or Cold-Drawn Steel Wire, or Welded Steel Wire Fabric for Concrete Reinforcement" Numbers A-15-48, A-16-48, A-160-46, A-60-48, A-185-46.

e. Metal accessories, including spacers, chairs, ties, and other devices necessary for properly assembling, placing, spacing and supporting all reinforcement in place shall be provided. All chairs in contact with forms shall be hot-dip galvanized with rounded legs.

B. Testing and Inspection of Materials:

Tests of concrete and materials shall be made under direction of the Engineer who shall have access to all places where concrete materials are stored, proportioned or mixed. The Contractor shall assist in obtaining and storing of samples for testing. THE CONTRACTOR SHALL PAY FOR ALL TESTING.

C. Storage of Materials:

Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter. Any materials which have deteriorated or has been damaged shall not be used for concrete.

D. Proportioning and Mixing:

a. Job mixed concrete shall be composed of one part cement, 2 parts fine aggregate and not more than 3 parts of coarse aggregate. Mixing water shall not exceed 6 gallons per sack of cement, including the free water in the aggregates. Mixing shall be continued for at least one minute after all materials are in the mixer.

b. 'Ready-mix' concrete may be used. Certification shall be furnished by the mixing plant that the concrete has a minimum 28 day compressive strength of 3500 pounds per square inch when tested by methods described in ASTM Standard C-39-44.

E. Forms:

Forms shall conform to the shape, lines, and dimensions of members called for on plans, and shall be sufficiently substantial and tight to prevent leakage of mortar. They shall be properly braced or tied together to maintain position and shape and be removable without injury to the concrete. Forms for footings may be omitted when soil is of sufficient firmness to permit concrete to be placed, subject to the approval of the Engineer.

F. Reinforcement:

Reinforcement shall be free from encrusting scale, rust or coatings that will reduce the bond to the concrete. Bars shall be accurately bent and placed in positions shown on drawings, securely supported and fastened, to prevent movement during placement of concrete.

a. Shop drawings shall be furnished to the Engineer for approval.

G. Depositing Concrete:

a. Soil boards for footings and slabs shall be approved by the Engineer before placing concrete.

b. Remove water and foreign matter from forms and excavations. Unless otherwise directed, wood forms shall be thoroughly wetted just prior to placing concrete.

c. Deposit concrete as nearly as practical in its final position to avoid segregation due to re-handling or flowing.

d. Reinforcing: No concrete that has partially hardened, or has been contaminated by foreign materials, or has been retempered, shall be used.

c. Continuity of Placing. Concreting shall generally be carried out as a continuous operation until the placing of an individual section is completed. When construction joints are necessary they shall be made and located with the approval of the Engineer.

f. Consolidation. Concrete shall be thoroughly consolidated by suitable means during placement, and shall be carefully worked around reinforcement and embedded fixtures, along surfaces and into the corners of forms. Vibrators may be used, provided they are operated under an orderly supervision and forms are constructed to withstand their action.

g. Cleaning Concrete Construction Joints. Before placing concrete adjoining construction joints in walls or slabs, the surfaces of the concrete already in place shall be picked brushed clean and given a coat of neat cement grout to provide a proper bond.

h. Metal Embellies shall be cut off at least 1/4 inch deep in the concrete immediately after removal of forms, and holes filled with 1:3 cement and sand mortar approximately the same color as the concrete. Mortar shall be mixed and placed as dry as practicable, and finish flush with adjacent surface. No galvanized shall be used.

H. Curing:

a. Protect all concrete work and cement finishes against injury from the elements and defacement during the curing period by approved means.

b. Curing. All concrete shall be maintained in a moist condition for at least the first seven days after placing. One of the following methods shall be used for curing unless another or equally efficient method is approved by the Engineer.

(1) Burlap Cover. Keep the slab wet by light sprinkling for the first twelve hours, and then cover with two layers of burlap kept continuously wet for the curing period.

(2) Paper Cover. Immediately following the initial 12 hours curing period, the surface shall be covered with a sheet of kraft waterproof paper (per Fed Specifications UU-B-34-1b, Type IV Class C), with paper edges carefully lapped and weighted, and left in place for the balance of the curing period.

J. Cold Weather Requirements:

Adequate equipment shall be provided for heating the concrete materials and protecting the concrete during freezing or near freezing weather. Surfaces against which concrete is to be placed, shall be free from frost. Whenever the temperature of the surrounding air is below 4 °F., concrete shall have a temperature of between 60°F and 70°F when placed in the forms, and shall be maintained at a temperature of not less than 50°F for at least 72 hours or for as much more time as is necessary to insure a proper rate of curing of the concrete. The covering protection used in connection with curing shall remain in place, and intact, at least 24 hours after artificial heating is discontinued.

K. General requirements:

The contractor shall furnish and install all concrete, forms, reinforcing steel and related items required to complete the work indicated on the drawings and specified herein. Plane walls may be built in sections as approved by the Engineer. All forms must be approved before placing and compacting adjacent fill.

1-6 EARTH DAM

A. Material:

Borings and Soil Laboratory Analysis indicate that an adequate supply of suitable material is available on the site. Material will be selected by the Engineer and shall be described in accordance with his instructions.

1-7 DEPOSITING AND COMPACTION

Earth for the dam shall be deposited in 6 to 8 inch layers and thoroughly compacted with at least 6 passes of equipment to the Engineer's satisfaction. At the time of placing, the soil shall have a water content of 12-14% and shall obtain a dry unit weight of 116 pcf. After 4 feet of fill has been placed tests will be made by the Engineer to verify water contents and unit weights and any changes in compacting procedure will be made at this time.

1-8 SPILLWAY CHANNELS

Refer to the drawings for plans and details of the reinforced concrete spillway channels. Contractor shall meet all of the requirements specified herein for the concrete items.

1-9 CHLORINATOR LINES

This contractor shall furnish and install Polyethylene flexible pipe and Polypropylene fittings as indicated on the plans from outlet of chlorinator equipment in chlorination room to outlets in floor and/or face of dam.

This contractor shall furnish and install 3/4"IPS cast type diffusers with all cast or Ductile Iron cubes and one diffuser, channel type for 3/4" cast iron pedestal in flume.

The complete installation shall be made in accordance with requirements of the manufacturer of chlorinator equipment.

Chlorinator equipment and installation in the chlorinator room will be done by others under another contractor which will be underway at the same time as this contract.

DIVISION II

GENERAL SITE WORK

2-1 GENERAL

The General Conditions of the General Contract Specifications apply to all work done under this contract and are hereby made a part of this specification.

2-2 SCOPE

Under this division of the specification the contractor shall complete all work specified herein or indicated on the plans not specifically included in any other division or not noted on the plans as being done by others. This work includes stripping, grading, seeding and sodding, driveways, parking area, concrete splash pad, cleanup of general site area, fencing etc.

2-3 STRIPPING

This contractor shall remove and stockpile where directed existing loam from areas to be disturbed during construction of the dam and parking area. He shall strip and stockpile where directed all material unsuitable for construction of the dam which prevents access to suitable material. Such material unsuitable for dam construction may be used for grading general fill areas as required but the excess of all shall be removed from the site.

2-4 GRADING

This contractor shall grade the site as indicated on the plans to required subgrades.
Subgrades shall be as follows:
Seed areas 1½" below finish grade.
Lawn areas 4" below finish grade.
Driveways and Parking Areas 8" below finish grade.

All areas from which material for construction of the dam is taken shall be graded to uniform slopes not exceeding 3:1 and in a manner to provide proper and adequate drainage to the satisfaction of the Engineer. Such areas unless specifically otherwise designated on the plans shall become lawn areas.

2-5 SEEDING AND SODDING

All areas located on the plans and other areas where cover is disturbed during construction of the work not specifically designated as being left bare shall be treated as lawn areas and shall be seeded or sodded as required herein.

The top of the new dam as denignated on the plans and all areas having a slope 2:1 or greater shall be sodded. Remaining lawn areas shall be seeded.

Sod shall be established lawn sod, strongly rooted and free of all weeds and unsuitable grasses. It shall be mowed before lifting and have not less than one inch of soil,

Subgrade shall be established at four inches below finish grade and lime shall be applied at the rate of 50 pounds to 1000 square feet.

Top soil shall be spread and lightly compacted to within the thickness of the sod and finished grade. No top soil shall be spread in a frozen or muddy condition.

Sod shall be laid so that no void occurs and shall be tamped or rolled. Screened top soil shall be brushed or raked over the sod area and shall include commercial fertilizer at the rate of 50 pounds to 1000 square feet. Sod shall then be thoroughly watered. The completed sod surface shall be true to finish grade even and firm at all points.

Sod on slopes steeper than 2-1/2 to 1 shall be held in place by wooden pins approximately one inch by one and six inches long driven through the sod into the soil until they are flush with the top of the sod.

Soil for lawn areas will consist of loam stripped and stocked under the contract, loam stripped and stockpiled under previous contracts. It is understood that sufficient loam to complete required work exists within the limits of Knot Park and that the contractor will not be required to bring loam to the job from outside the Park limits without additional compensation.

Lime shall be applied to the sub-surface of lawn areas at the rate of 50 pounds to 1000 square feet. Sub-grade soil shall be loosened and raked to a depth of 2 to 4 inches and all stones over 2 inches in size, sticks and rubbish removed. No heavy objects except lawn rollers shall be moved over lawn areas after the sub-grade soil has been prepared unless the sub-grade soil is again graded and loosened as specified above before topsoil is spread. After the sub-grade soil has been prepared, to soil shall be spread evenly thereon and lightly compacted. No topsoil shall be spread in a frozen or muddy condition. Topsoil shall be brought to finish grade. Allowance for settlement shall be made.

Commercial Fertilizer shall be applied to the lawn areas at the rate of 50 pounds to 1000 square feet. Fertilizer may be applied with seed.

Grass seed shall be of last year's crop available and shall be a mixture of the following kinds in the percentage indicated. The mixture shall not contain over 0.05% weed seeds or 3% inert matter.....

Proportion by Weight	Kind of Seed	Purity	Germination
50%	Crewings N.J. Fescue or Illahee Creeping Fescue	98	85
20%	Kentucky Blue	87	85
30%	Common Ryegrass	90	90

Any soil, manure, peat or similar material which has been brought onto areas other than lawn areas by hauling operations or otherwise shall be removed promptly, keeping these areas clean at all times. Upon completion of planting all excess soil, stones, and debris which has not previously been cleaned up shall be removed from the site or disposed of as directed by the Engineer.

Lawns shall be protected and maintained by watering, mowing and replanting for at least 60 days and as much longer as is necessary to establish a uniform stand of the specified grasses and until acceptance.

2-6 DRIVEWAYS AND PARKING AREAS

This contractor shall build all driveways and parking areas as shown on the plans. Sub-grade shall be prepared to line and grade 8" below finish grade. 8" of bank gravel meeting the Engineer's requirements and having his approval shall be placed graded and rolled to finish elevations and sections. Gravel shall have no stone greater than 4 inches in cross section. Place 1/2 inch of stone dust on top of gravel, mix thoroughly with upper one or two inches of gravel, wet thoroughly and reroll with heavy roller. Furnish and install drain inlets drain piping headwalls and splash pads as detailed on the plans.

2-7 FENCING

This contractor shall furnish and install a six foot high chain link fence where indicated on the site plan. Posts shall be 10'1" on centers. Line posts shall be 2-1/4" H columns, weighing 4.1# per foot. End, corner, and pull posts shall be 3" diameter 5.79# per foot. Corner braces shall be 1-5/8" diameter 2.27# per foot and 3/8" round rod trusses with turnbuckles. Top rail shall be 1-5/8" diameter 2.27# per foot. Bottom rail shall be 1-1/2" H beam 2.27# per foot. Fabric shall be 2" mesh - 9 gauge. Gate shall be 10' double swinging, with 3" diameter 5.79# per foot gate posts and 2" diameter gate frame with 3/8" truss rod cross braces. Fabric shall match fence. Gates shall be complete with hinges, locking device and hold backs. Posts shall be set 2'6" in 3'0" deep 12" round 2500# concrete foundation crown top of founlation concrete to shed water.

Connecticut River Flood Control Project - Conant Brook Dam - Volume I - April 1964



1964 Reports

Construction of Dam & appurtenant structures.

City/Town	Monson
Dam	Conant Brook Dam
Name	Massachusetts Comm
Name	U S Army Engineers
Water	Conant Brook
Water	Chicopee River

CONNECTICUT RIVER FLOOD CONTROL PROJECT

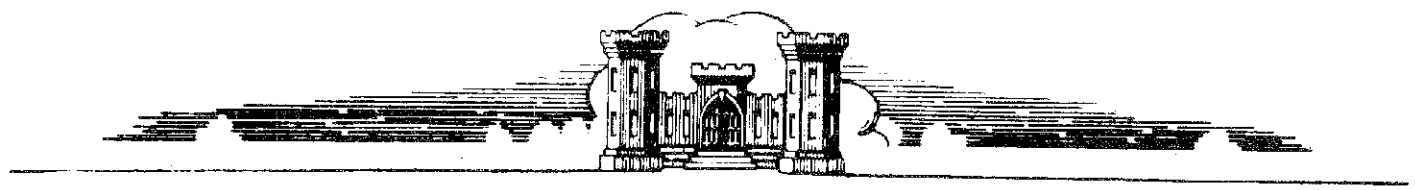
CONANT BROOK DAM

CHICOPEE RIVER, MASSACHUSETTS

PLANS FOR THE

CONSTRUCTION OF DAM AND APPURTENANT STRUCTURES

VOLUME I

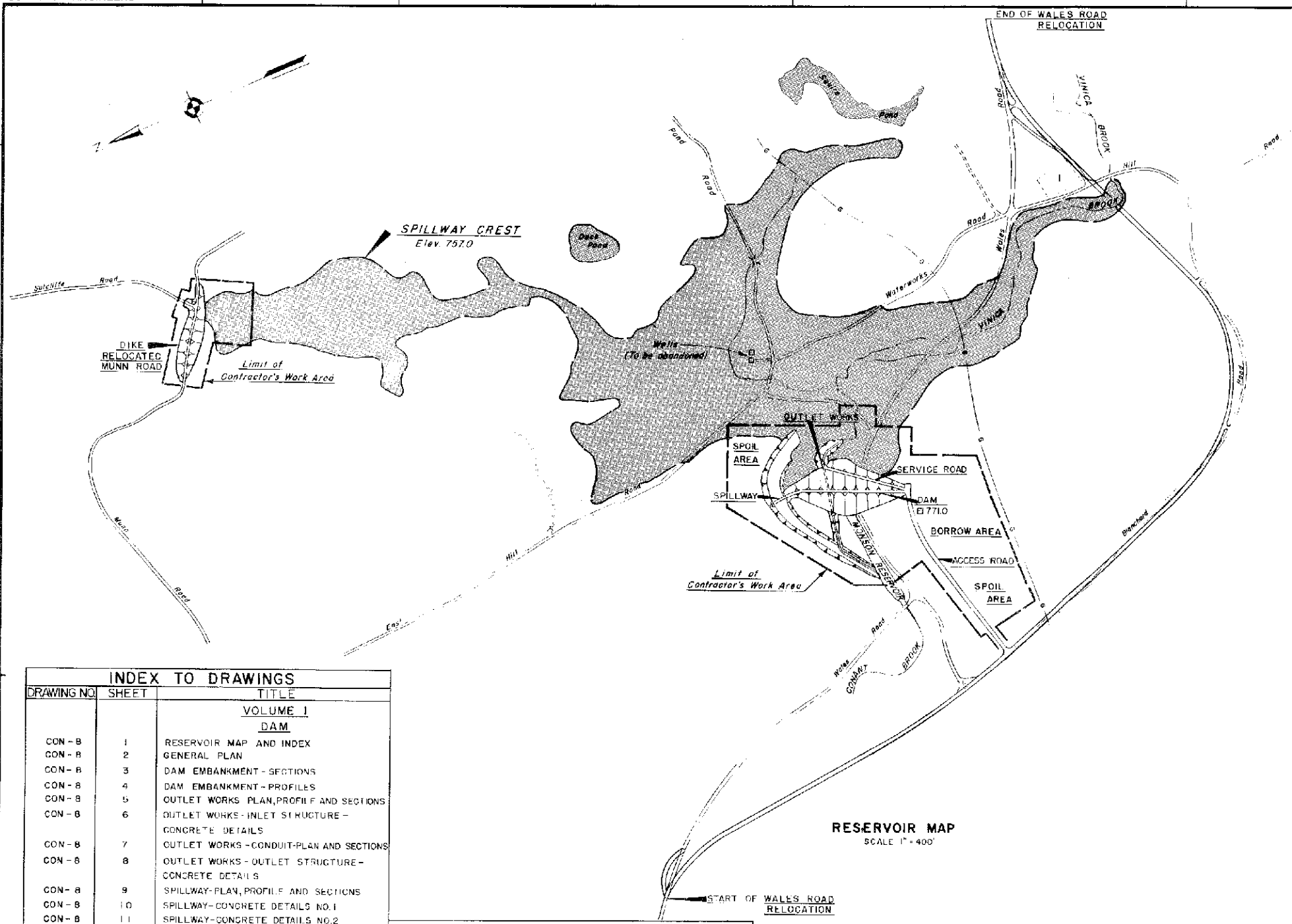


U.S. Army Engineer Division, New England
Corps of Engineers Waltham, Mass.

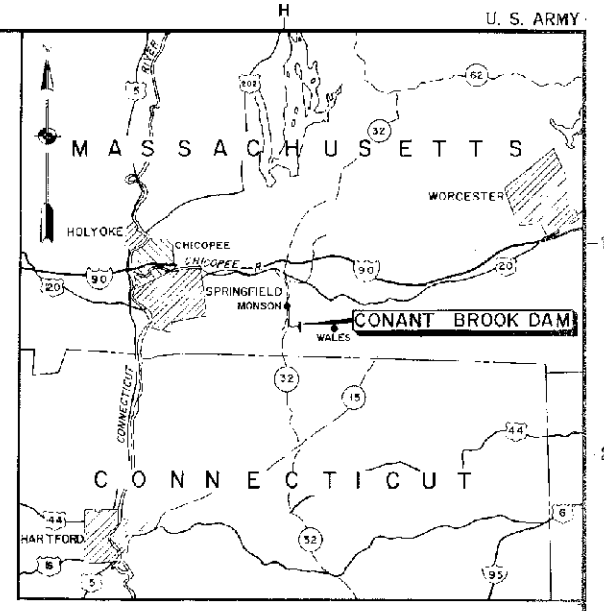
APRIL 1964

All drawings in this folio have been reduced to one half the original scale.

CORPS OF ENGINEERS — U. S. ARMY



RESERVOIR MAP
SCALE 1" = 400'



LOCATION MAP
SCALE: 1" = 8 MI.

INDEX TO DRAWINGS

DRAWING NO.	SHEET	TITLE
		VOLUME I
		DAM
CON-8	1	RESERVOIR MAP AND INDEX
CON-8	2	GENERAL PLAN
CON-8	3	DAM EMBANKMENT - SECTIONS
CON-8	4	DAM EMBANKMENT - PROFILES
CON-8	5	OUTLET WORKS PLAN, PROFILE AND SECTIONS
CON-8	6	OUTLET WORKS - INLET STRUCTURE - CONCRETE DETAILS
CON-8	7	OUTLET WORKS - CONDUIT-PLAN AND SECTIONS
CON-8	8	OUTLET WORKS - OUTLET STRUCTURE - CONCRETE DETAILS
CON-8	9	SPILLWAY-PLAN, PROFILE AND SECTIONS
CON-8	10	SPILLWAY-CONCRETE DETAILS NO.1
CON-8	11	SPILLWAY-CONCRETE DETAILS NO.2
CON-8	12	DIKE-PLAN, PROFILES AND SECTIONS
CON-8	13	LOG BOOM, STAFF GAGES AND PARKING AREA
CON-8	14	BUBBLE GAGE SHELTER-DETAILS
CON-8	15	BUBBLE GAGE SHELTER-STEEL REINFORCEMENT
CON-8	16	PLAQUE-SECTIONS AND DETAILS
CON-8	17	PLAN OF FOUNDATION EXPLORATIONS
CON-8	18	GEOLOGIC - LOG SECTIONS - DAM
CON-8	19	GEOLOGIC - LOG SECTIONS - SPILLWAY
CON-8	20	GEOLOGIC - LOG SECTIONS - CONDUIT
CON-8	21	RECORD OF FOUNDATION EXPLORATIONS NO.1
CON-8	22	RECORD OF FOUNDATION EXPLORATIONS NO.2
CON-8	23	RECORD OF FOUNDATION EXPLORATIONS NO.3
CON-8	24	RECORD OF FOUNDATION EXPLORATIONS NO.4
CON-8	25	PLAN OF BORROW EXPLORATIONS
CON-8	26	RECORD OF BORROW EXPLORATIONS
CON-8	27	HYDROGRAPHS
CON-8	27A	CONSTRUCTION SIGN
		DRAWINGS INCLUDED IN SPECIFICATIONS
40-05-06	1 OF 1	SAFETY SIGN
40-16-08	—	SAFETY FENCE - 4' FABRIC
STD-8	—	STRUCTURAL JOINT DETAILS

INDEX TO DRAWINGS (CONT.)

DRAWING NO.	SHEET	TITLE
SK106		STORAGE BUILDING
		JUTE MATTING - INSTALLATION DETAILS
		VOLUME II
		HIGHWAY RELOCATION AND ACCESS ROAD
CON-9	INDEX ON SHEET 1	GENERAL PLAN AND INDEX

NOTE
For General Notes, see Sheet 2
For Legend, see Sheet 2
For details of wells to be abandoned see specifications.

GRAPHIC SCALES
1" = 400'-0" 400' 0 400' 800'
1" = 8 MI. 8 MI. 0 8 MI. 16 MI.

NO.	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY | DR. BY A.J.H. | C.K. BY W.J.
SUBMITTED:
CHIEF, ENGR. SECTION
REVIEWED:
PROJECT ENGINEER
APPROVED:
CHIEF, ENGR. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
RESERVOIR MAP AND INDEX
CHICOPEE RIVER, MASSACHUSETTS

APPROVED:
CHIEF ENGINEER'S DIVISION
DATE APRIL 1964

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 10-016-64-45
DRAWING NUMBER
CON-8
SHEET 1

CORPS OF ENGINEERS — U. S. ARMY

PLAN

SCALE: 1" = 40'

LEGEND

- ---750--- Contour (orig ground surf.)
- Rock or ledge outcrop (plan)
- Earth cut and rock cut.
- Earth cut with rock slope protection.
- Earth fill.
- Earth fill with rock slope protection.
- Earth surface (section)
- Assumed bedrock surface or rock cut (Section)
- Staff gage
- G—G— Tennessee Gas Line

BORROW AREA
Excavate to El. 771.0

For detail of PARKING AREA, see Sheet 13.

GENERAL NOTES

1. Elevations refer to Mean Sea Level Datum.
2. Plane coordinates refer to Massachusetts Lambert Grid System.
3. Figures in hexagon indicate item numbers under which payment will be made.
4. All topsoil, 6" in thickness unless otherwise noted.
5. For limits of Contractor's Work Area, see Sheet 1.
6. For fence and gate details, see specifications.
7. Strip to suitable material.

NOTES

1. For Dam Embankment, Profiles, Sections and Details, see Sheet 3 and 4.
2. For Outlet Works, Plan, Profile, Sections and Details, see Sheets 5 thru 8.
3. For Spillway Plan, Profile and Sections, see Sheets 9 thru 11.
4. For Bubble Gage Shelter details, see Sheets 14 & 15.
5. For Log Boom, Staff Gages & Parking Area details, see Sheet 13.
6. For excavating and refilling of the excavation for the removal of the C.I. water main, see Sheet 3.

GRAPHIC SCALE
1" = 40' — 40' 0 40' 80'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

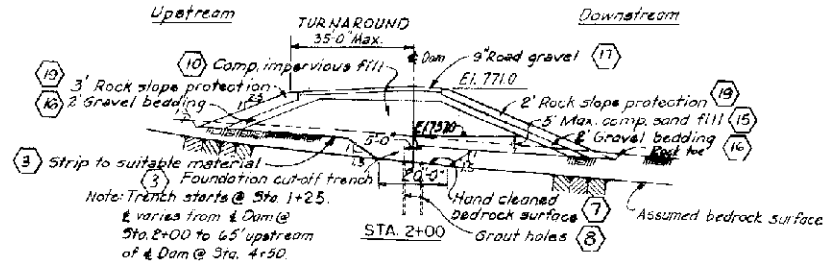
DES. BY	DR. BY	CK. BY
J.J.C.	E.K.	W.L.S.

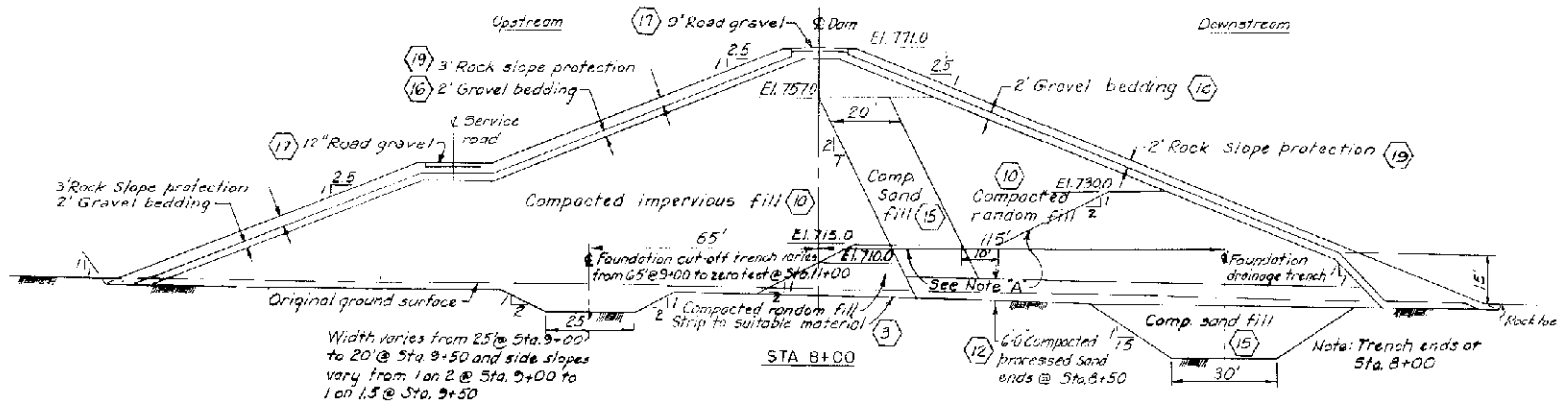
SUBMITTED: CHIEF, LAYOUT SECTION
REVIEWED: PROJECT ENGINEER
APPROVED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION — DATE APRIL 1964

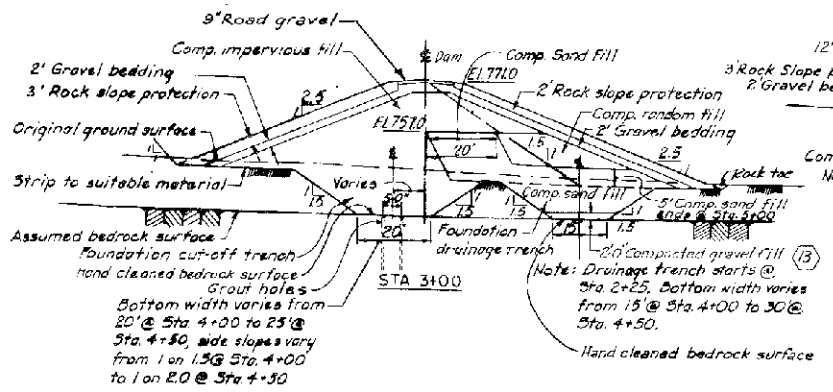
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
GENERAL PLAN
CHICOPEE RIVER — MASSACHUSETTS

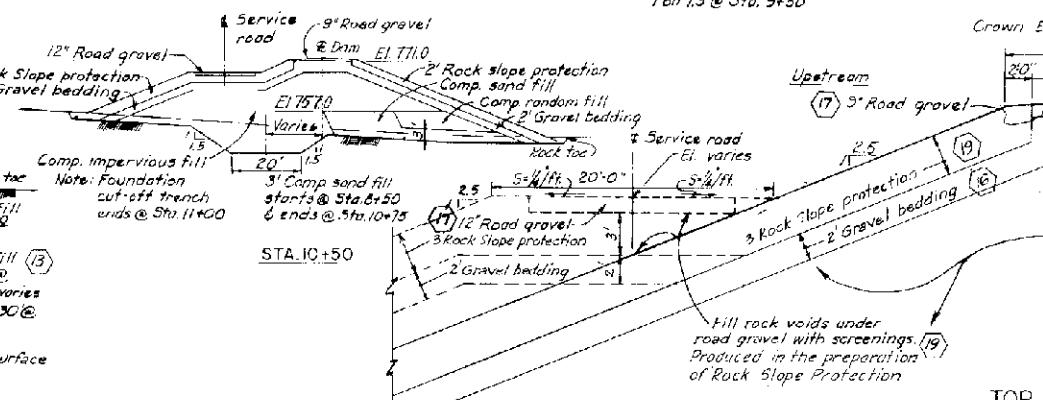
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DRAWING NUMBER
CON - 8
SHEET 2

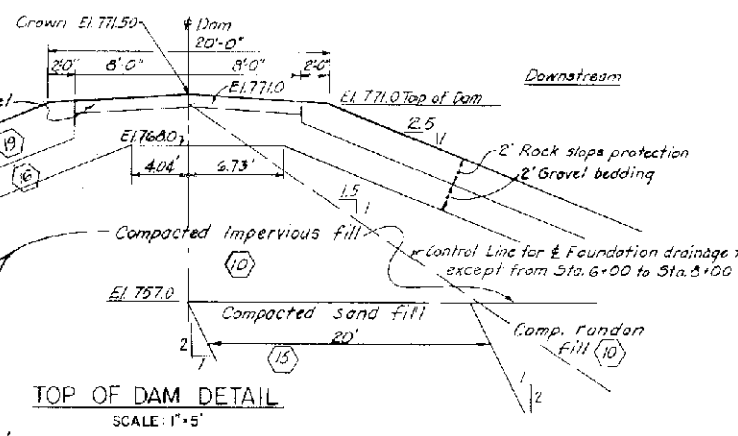
CORPS OF ENGINEERS — U. S. ARMY



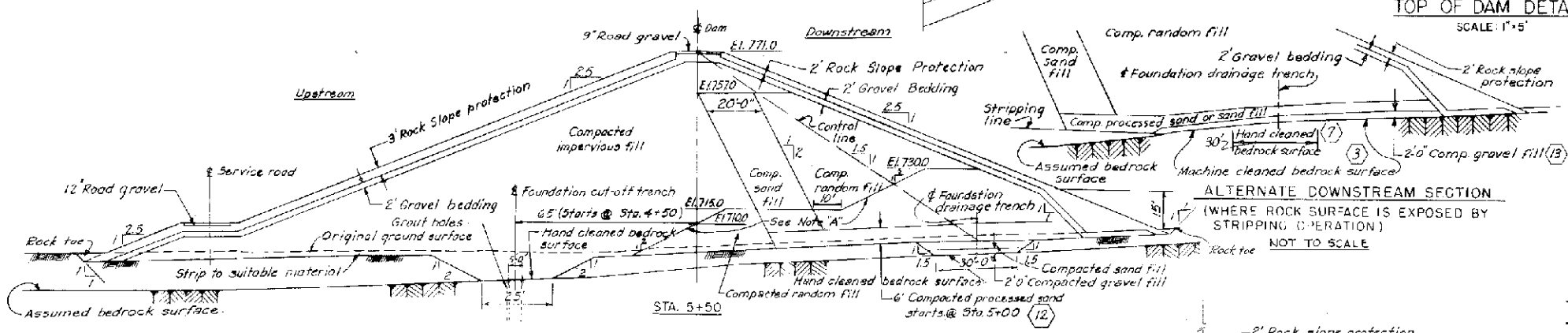




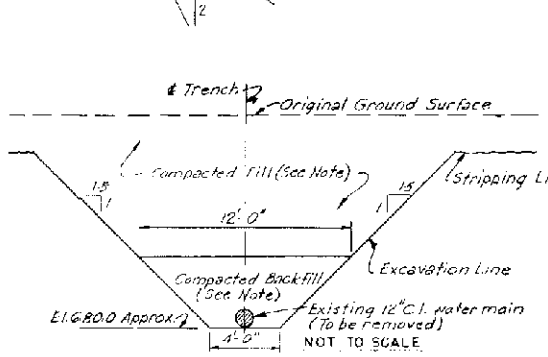




TOP OF DAM DETAIL
SCALE: 1"=5'



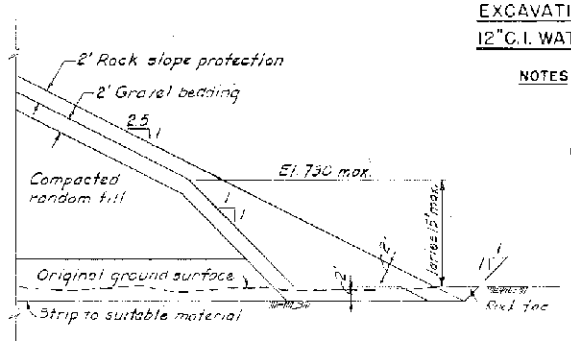
ALTERNATE DOWNSTREAM SECTION
(WHERE ROCK SURFACE IS EXPOSED BY STRIPPING OPERATION)
NOT TO SCALE



NOT TO SCALE

EXCAVATION AND REFILL OF TRENCH FOR REMOVAL OF EXISTING 12" C.I. WATER MAIN THRU DAM EMBANKMENT FOUNDATION AREA

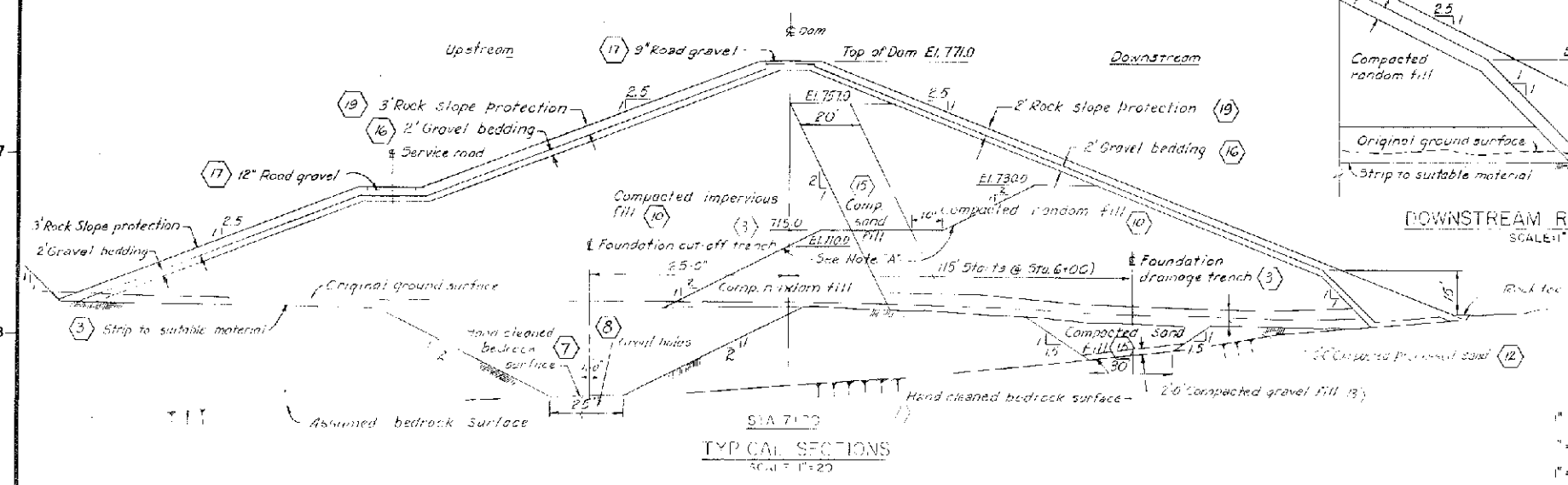
NOTES 1. Compacted Impervious Fill and Compacted Impervious Backfill shall be placed in trench upstream from the inclined Compacted Sand Fill Section.
2. Compacted Gravel Backfill and Compacted Sand Fill shall be placed in trench downstream from inclined Compacted Sand Fill Section.
3. Ends of pipe to be plugged with concrete as specified.



DOWNSTREAM ROCK FILL TOE
SCALE: 1"=10'

NOTES

"A" Limit for placement of compacted random fill, compacted sand fill and compacted processed sand fill prior to placement of adjoining fills.



TYPICAL SECTIONS
SCALE: 1"=20'

GRAPHIC SCALES
1" = 5'-0"
1" = 10'-0"
1" = 20'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.J.C.	D.W.	W.J.S.

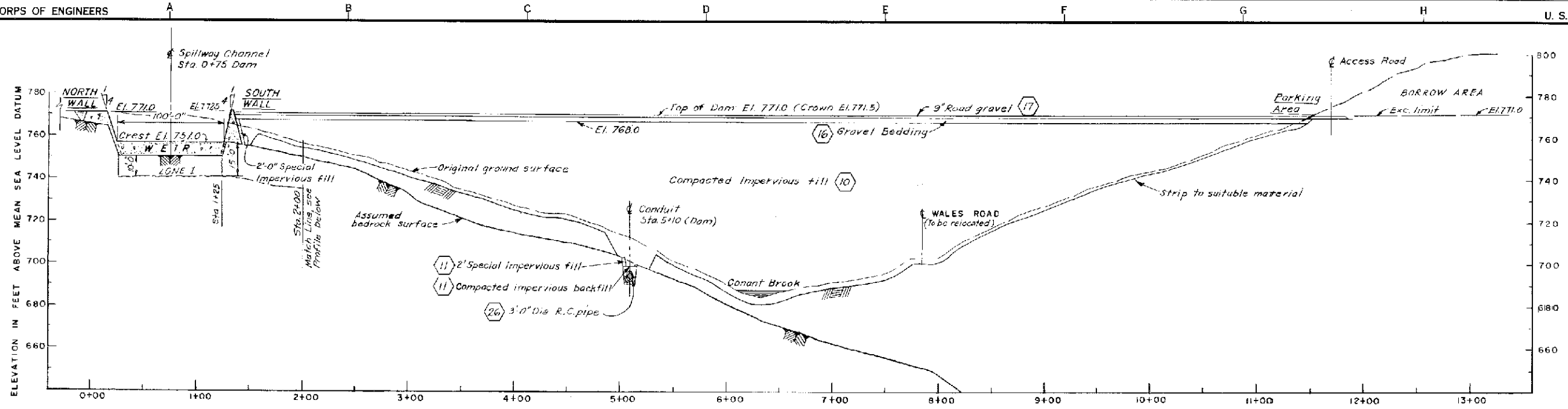
SUBMITTED: Chief, Civil Section
REVIEWED: Project Engineer
APPROVED: Chief, Design Branch
APPROVED: Chief, Engineering Division
DATE: APRIL 1964

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
DAM EMBANKMENT SECTIONS

CHICOPEE RIVER — MASSACHUSETTS

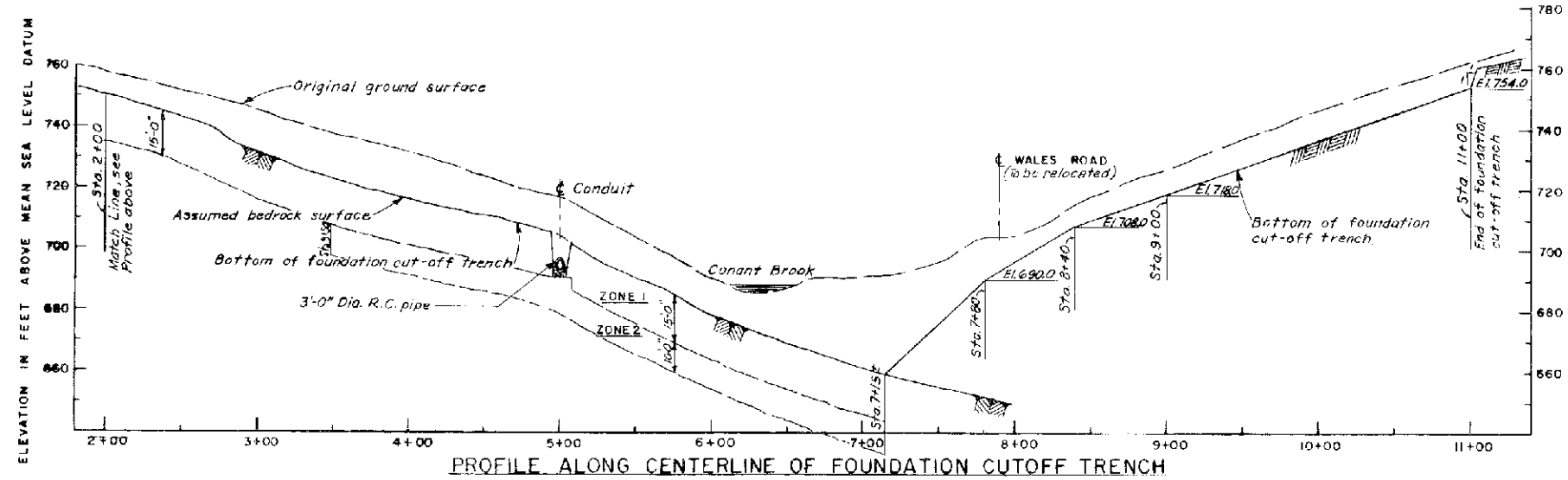
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON-8
SHEET 3

CORPS OF ENGINEERS — U. S. ARMY



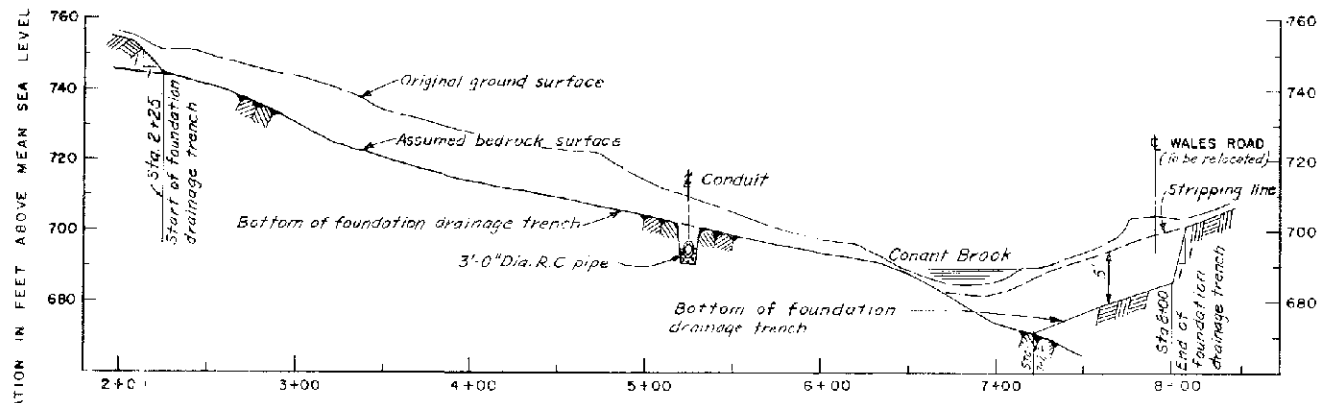
PROFILE ALONG ℄ OF DAM

SCALE: HOR. 1"=40'
VERT. 1"=20'



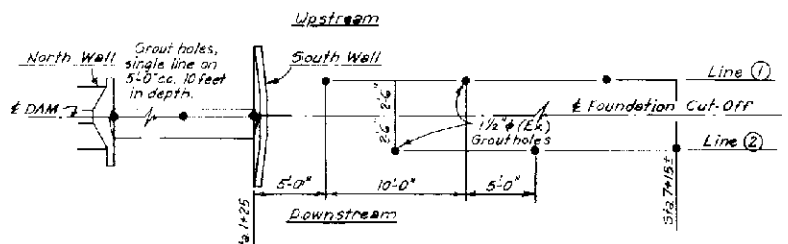
PROFILE ALONG CENTERLINE OF FOUNDATION CUTOFF TRENCH

SCALE: HOR. 1" = 40'
VERT. 1" = 20'



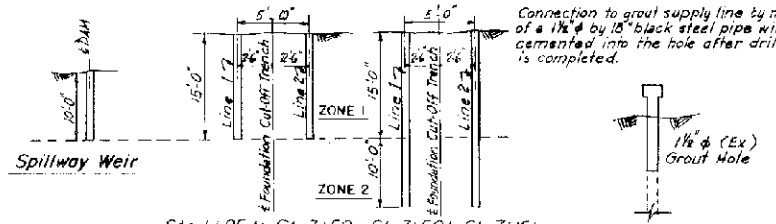
PROFILE ALONG CENTERLINE OF FOUNDATION DRAINAGE TRENCH

SCALE HOR. 1" = 40'
VERT. 1" = 20'



PLAN OF GROUT CURTAIN (NOT TO SCALE)

Typical initial grout hole spacing along Spillway Weir & Foundation Cut-Off.

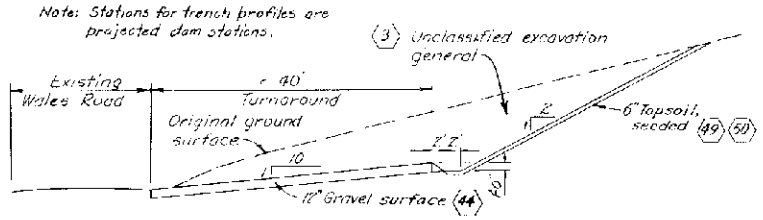


Sta. 1+25 to Sta. 3+50 Sta. 3+50 to Sta. 7+15

FOUNDATION CUT-OFF TRENCH (NOT TO SCALE)

GROUT HOLE DETAIL

Note: Stations for trench profiles are projected dam stations.



TURNAROUND DETAIL

SCALE: 1" = 10'

GRAPHIC SCALES

1" = 10' 10' 0 10' 20'
1" = 20' 20' 0 20' 40'
1" = 40' 40' 0 40' 8

NOTES

Grouting of holes on Line 1 will be completed in any Zone or Section prior to grouting respective Zone or Section in Line 2 holes.

Grouting in Zone 1 to be completed prior to grouting Zone 2.

Exposed rock surface in base of exploration cut-off to be cleaned and loose rock removed to facilitate observation for and caulking of grout leaks.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
W.C.	E.K.	W.J.

SUBMITTED: Chief, Layout Section

REVIEWED: Project Engineer

RECOMMENDED: Chief, Design Branch

APPROVED: Chief, Engineering Division

DATE: APRIL 1964

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
DAM EMBANKMENT
PROFILES
CHICOPEE RIVER — MASSACHUSETTS

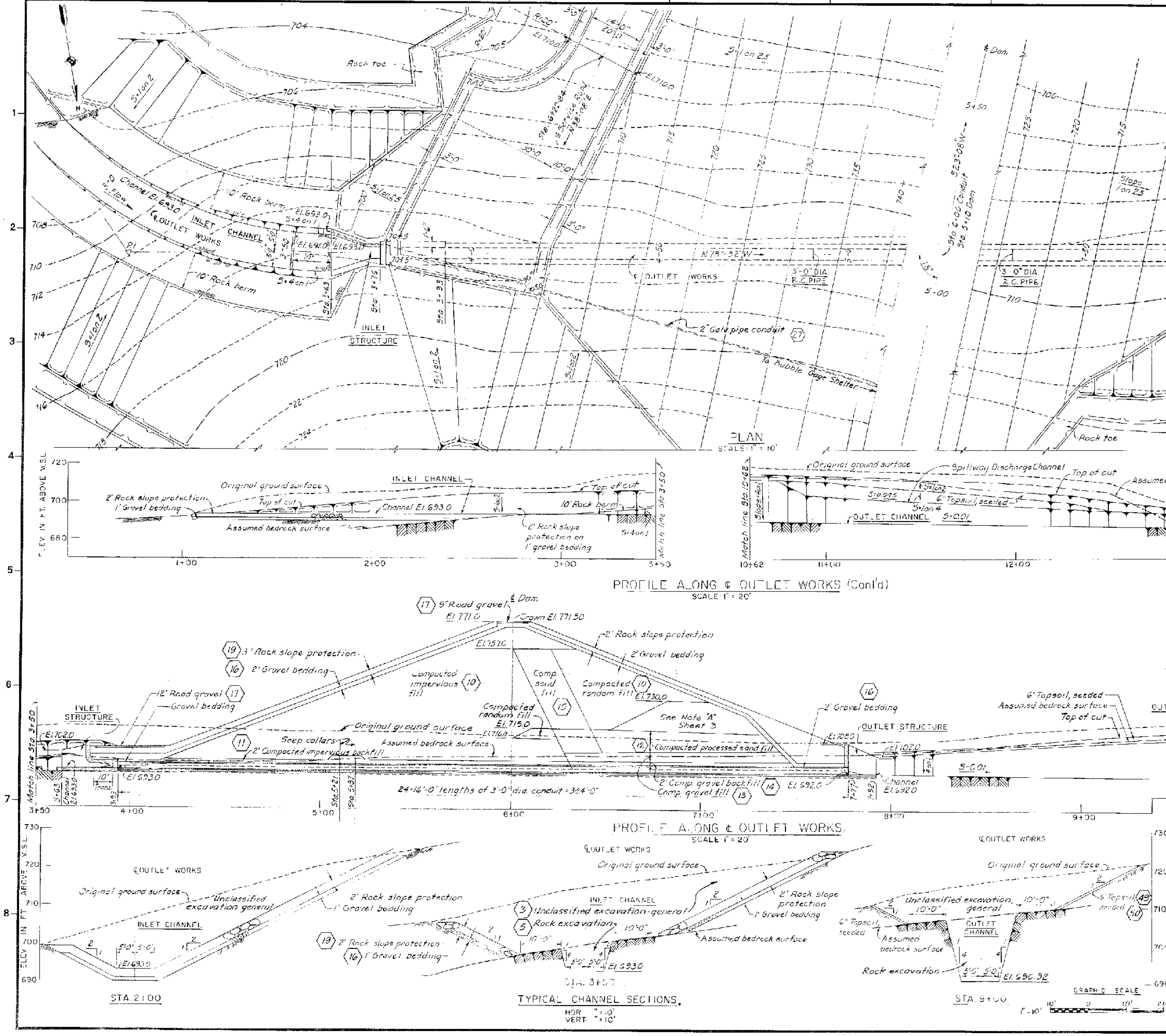
SCALE AS SHOWN

SPEC. NO. CIV. ENG. 19 018 64-43

DRAWING NUMBER
CON-8

SHEET 4

CORPS OF ENGINEERS — U. S. ARMY



NOTES

For notes applying to this sheet, see Sheet 8.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY M.Z. — DR. BY D.McD. — CK. BY W.J.

SUBMITTED: CHIEF, LAYOUT SECTION

REVIEWED: PROJECT ENGINEER

APPROVED: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
OUTLET WORKS
PLAN, PROFILE AND SECTIONS

CHICOPEE RIVER — MASSACHUSETTS

DATE APRIL 1964

SCALE 1" = 10'

SPEC. NO. CIV. ENG. 19-016-64-43

DRAWING NUMBER CON-8

SHEET 5

CORPS OF ENGINEERS

U. S. ARMY

PLAN
SCALE: 3/8"=1'-0"

NOTE
All trash rack members shown are steel hollow tubing, of 1/4" wall thickness.

SECTION F-F
NO SCALE

DETAIL "A"

DETAIL 'B'
NO SCALE

TRASH RACK CONNECTION DETAIL
SCALE: 1 1/2"=1'-0"

SECTION D-D
SCALE: 3/8"=1'-0"

NOTE:
All longitudinal reinforcing #6@1'-0" each face.
All reinforcing not noted, #6@1'-0".

SECTION E-E
SCALE: 3/8"=1'-0"

SECTION C-C
SCALE: 3/8"=1'-0"

NOTE:
All longitudinal reinforcing #6@10" each face.
All reinforcing not noted #6@1'-0".

TYPICAL CONDUIT SECTION
SCALE: 3/8"=1'-0"

DETAIL "A"
NO SCALE

SECTION A-A
SCALE: 3/8"=1'-0"

NOTE:
All longitudinal reinforcing #6@1'-0" each face.
All reinforcing not noted, #6@1'-0".

ALTERNATE CONDUIT SECTION
STA. 3+93 TO STA. 5+00±
SCALE: 3/8"=1'-0"

NOTES FOR PRECAST CONCRETE PIPE
Concrete must have a minimum ff. of 5000 p.s.i. at 28 days.
Steel reinforcement must have a minimum yield strength of 50,000 p.s.i.
Pipe to be designed for a vertical load of 48.6 K.P.L.F. from Sta. 3+93 to Sta. 6+90 and 29.4 K.P.L.F. from Sta. 6+90 to Sta. 7+77.
For details of pipe testing, see specifications.

PIPE JOINT DETAILS
NO SCALE

OPEN

CLOSED

SECTION G-G

COLLAR DETAILS
SCALE: 3/8"=1'-0"

SECTION H-H

GRAPHIC SCALES
1 1/2"=1'-0"
3/8"=1'-0"

NOTES

For notes applying to this sheet, see Sheet 8.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
K.E.	D.McQ.	

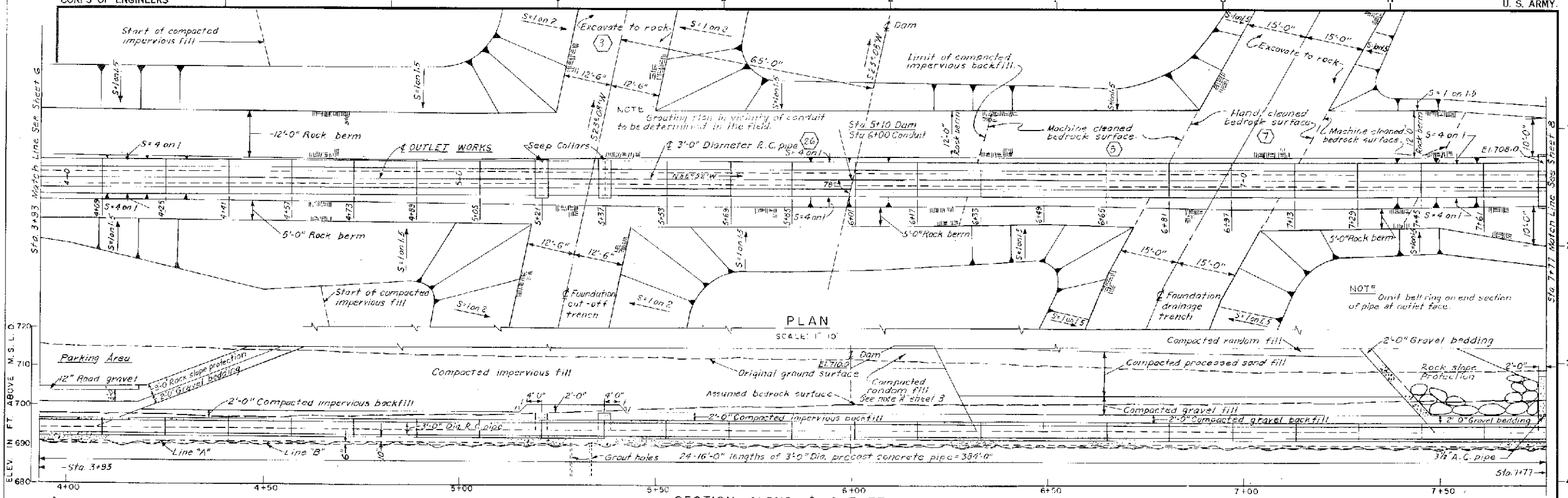
SUBMITTED: CHIEF, LEVEES SECTION
REVIEWED: PROJECT ENGINEER
APPROVED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION
DATE APRIL 1964

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
OUTLET WORKS
INLET STRUCTURE - CONCRETE DETAILS
CHICOPEE RIVER MASSACHUSETTS

SCALES AS SHOWN
SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON-8
SHEET 6

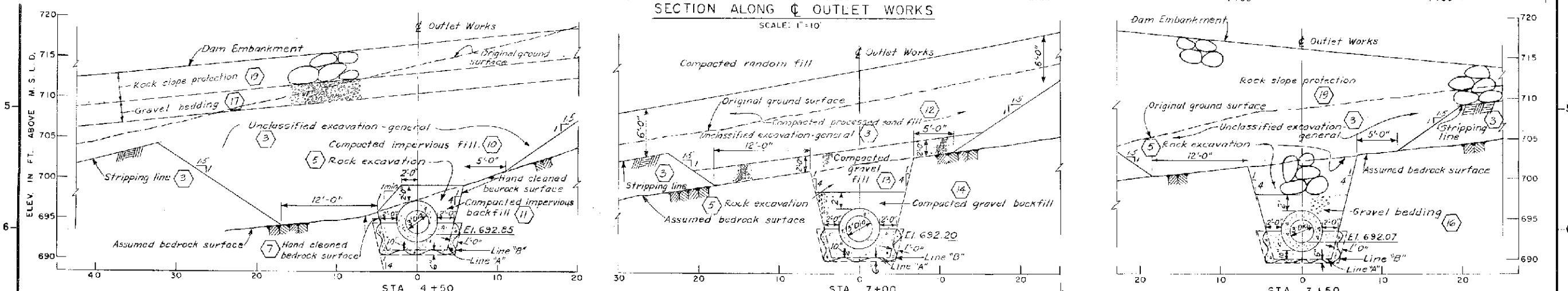
CORPS OF ENGINEERS

U. S. ARMY.



SECTION ALONG ℄ OUTLET WORKS

SCALE: 1"=10'



TYPICAL CONDUIT SECTIONS

SCALE: 1"=5'-0"

GRAPHIC SCALES

1"=5'

1"=10'

NOTES

For NOTES & DETAILS applying to this sheet, see Sheet 8.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.J.G.	A.J.H.	M.J.

SUBMITTED: Chief, Layout Section

REVIEWED: Project Engineer

APPROVED: Chief, Design Branch

APPROVED: Chief, Engineering Division

DATE APRIL, 1964

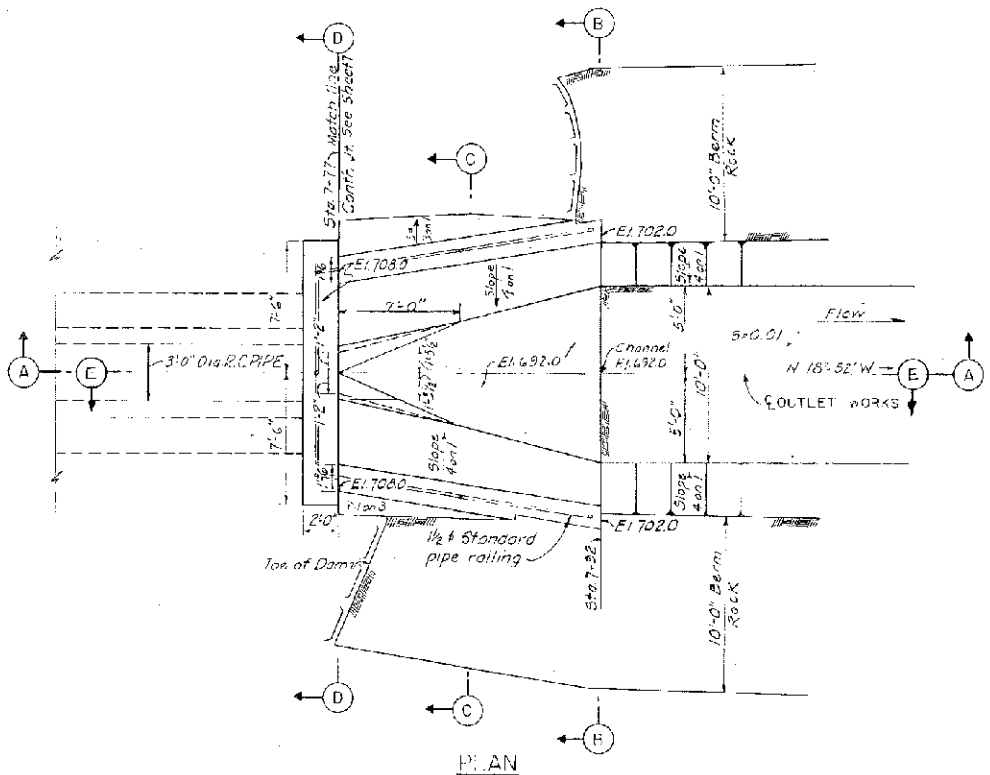
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
OUTLET WORKS
CONDUIT — PLAN AND SECTIONS
CHICOPEE RIVER MASSACHUSETTS

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-64-43

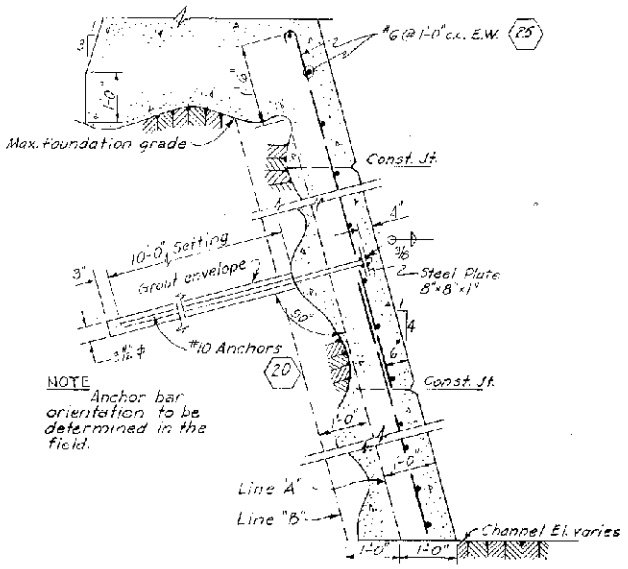
DRAWING NUMBER CON-8

SHEET 7

CORPS OF ENGINEERS — U. S. ARMY

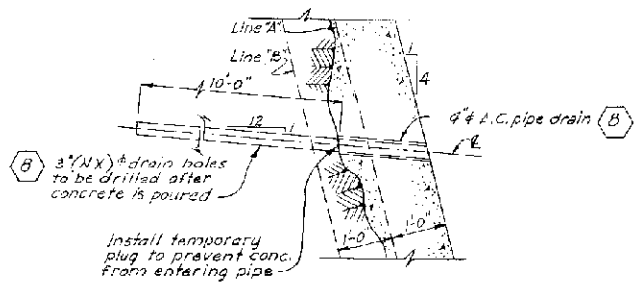


PLAN
SCALE: 1/4"=1'-0"



NOTE Anchor bar orientation to be determined in the field.

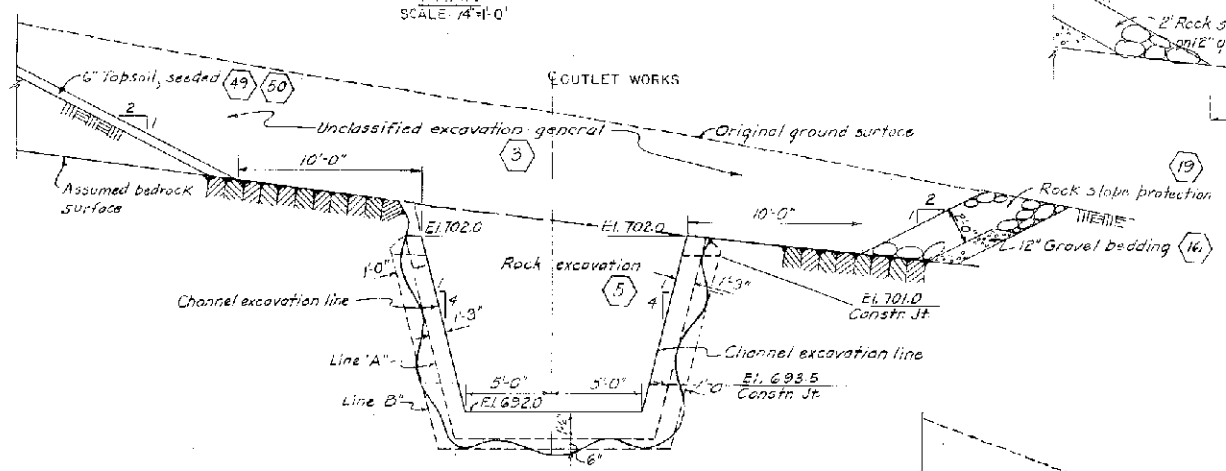
TYPICAL ANCHOR BAR AND REINFORCEMENT DETAIL
SCALE: 3/4"=1'-0"



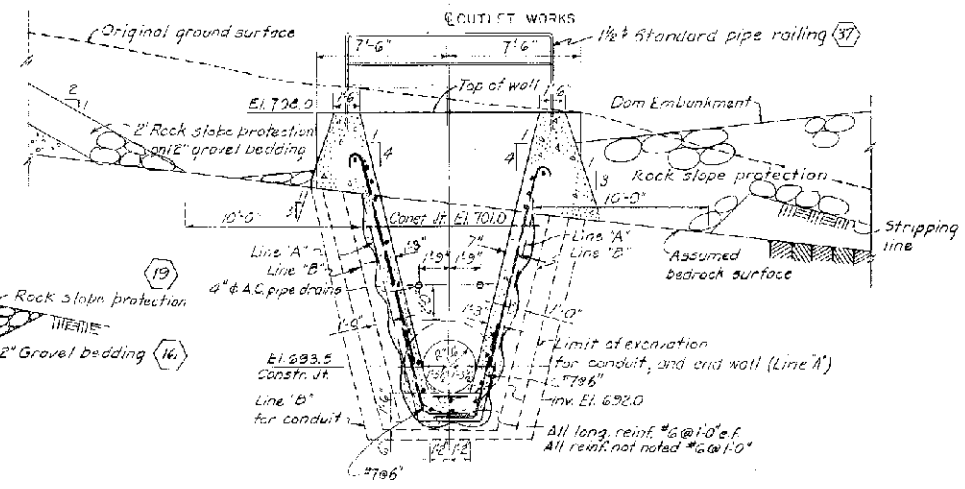
TYPICAL DRAINAGE DETAIL
SCALE: 3/4"=1'-0"

NOTES:

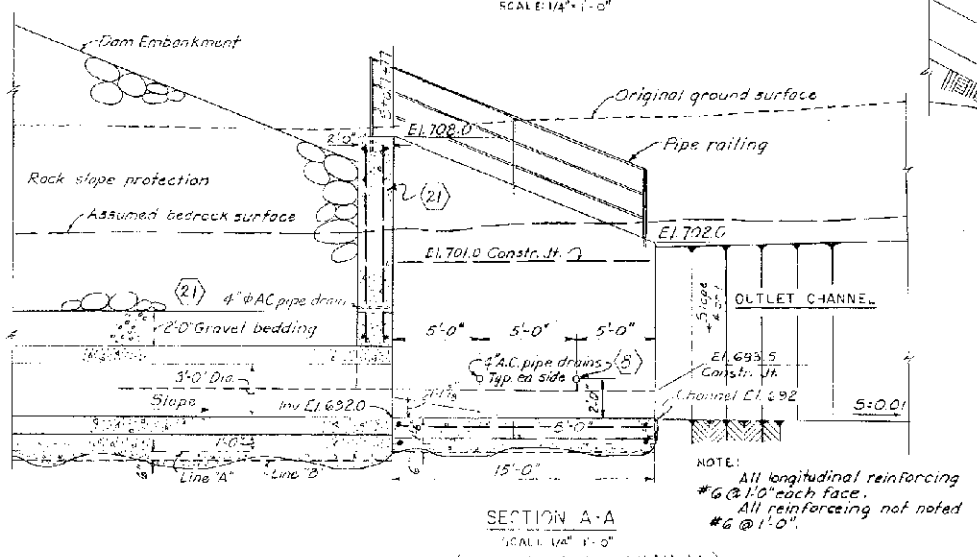
For details & location of Trash Rack, see Sheet 6.
Line "A" indicates minimum thickness of concrete.
Line "B" indicates payment line for rock excavation and concrete.
All exposed edges of concrete, including tops of walls, to be formed 1" - 45°.
All joints in face of concrete walls against which fills are to be placed shall be flush.
All reinforcing steel shown on this sheet shall be paid for under Item No. 25.
Bar splices shall lap 24 diameters of the smaller bar.
Minimum cover for all steel reinforcment shall be 4" except as noted.
All concrete from Sta. 3+63 to Sta. 3+93 and from Sta. 7+77 to Sta. 7+92 will be paid for under Item No. 21.
All concrete from Sta. 3+93 to Sta. 7+77 will be paid for under Item No. 22. 2'End Wall excluded.
All work in connection with furnishing and placing the 36" dia. R.C. pipe conduit will be paid for under Item No. 26.



SECTION B-B
SCALE: 1/4"=1'-0"

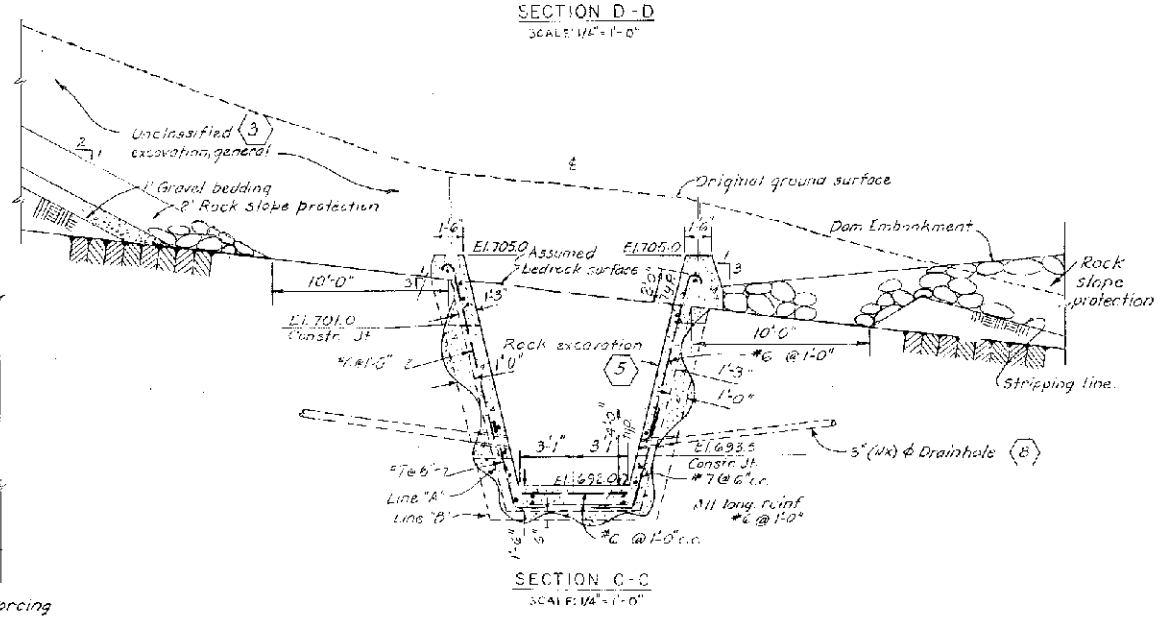


SECTION D-D
SCALE: 1/4"=1'-0"



NOTE: All longitudinal reinforcing #6 @ 1'-0" each face. All reinforcing not noted #6 @ 1'-0".

SECTION A-A
SCALE: 1/4"=1'-0"
(SECTION C-C SIMILAR)



SECTION C-C
SCALE: 1/4"=1'-0"

GRAPHIC SCALES
1/4"=1'-0" 0 4' 8'
3/4"=1'-0" 1' 2' 3'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.J.C.	D. McD.	W.J.

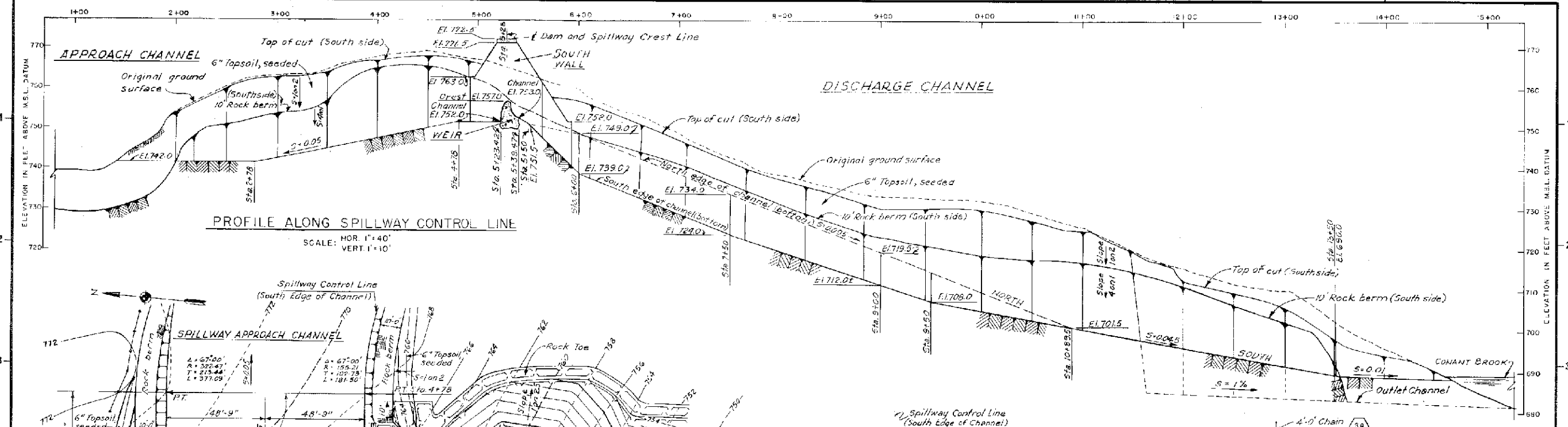
SUBMITTED: CHIEF, ENGINEERING SECTION
REVIEWED: PROJECT ENGINEER
APPROVED: CHIEF, DESIGN BRANCH

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
OUTLET WORKS
OUTLET STRUCTURE - CONCRETE DETAILS
CHICOPEE RIVER MASSACHUSETTS

APPROVED: CHIEF, ENGINEERING DIVISION
DATE APRIL 1964

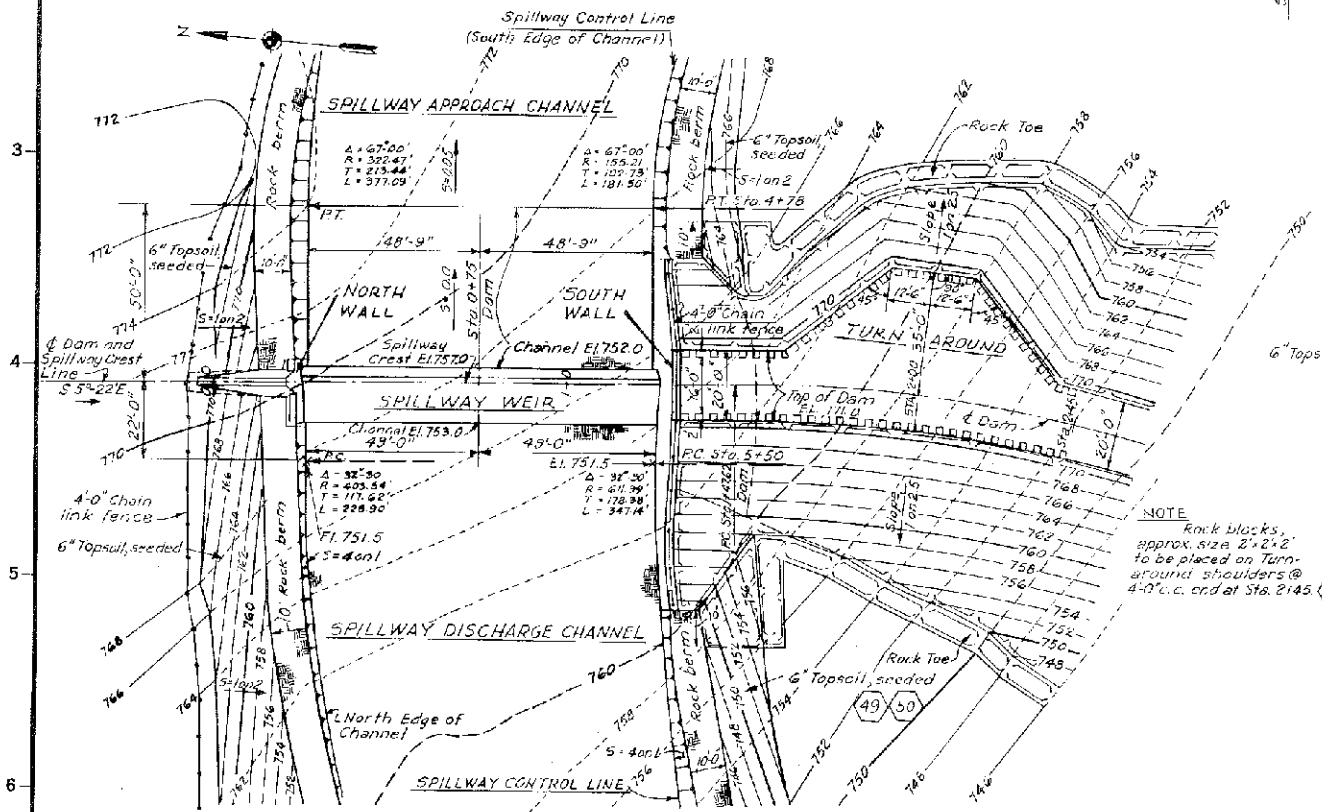
SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-64-45
DRAWING NUMBER
CON-8
SHEET 8

CORPS OF ENGINEERS — U. S. ARMY



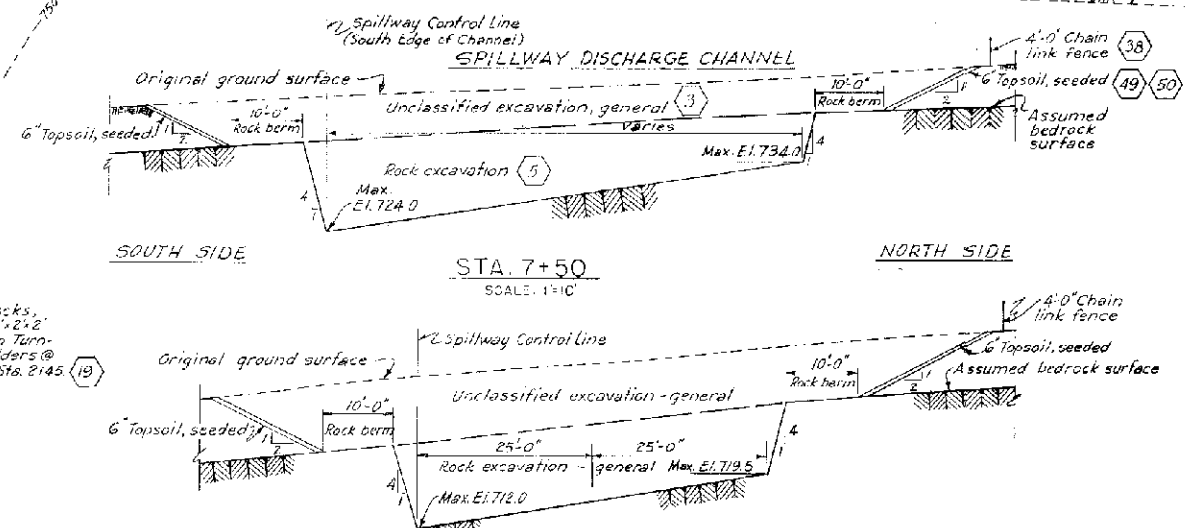
PROFILE ALONG SPILLWAY CONTROL LINE

SCALE: HOR. 1"=40'
VERT. 1"=10'



PLAN

SCALE: 1"=20'



SOUTH SIDE

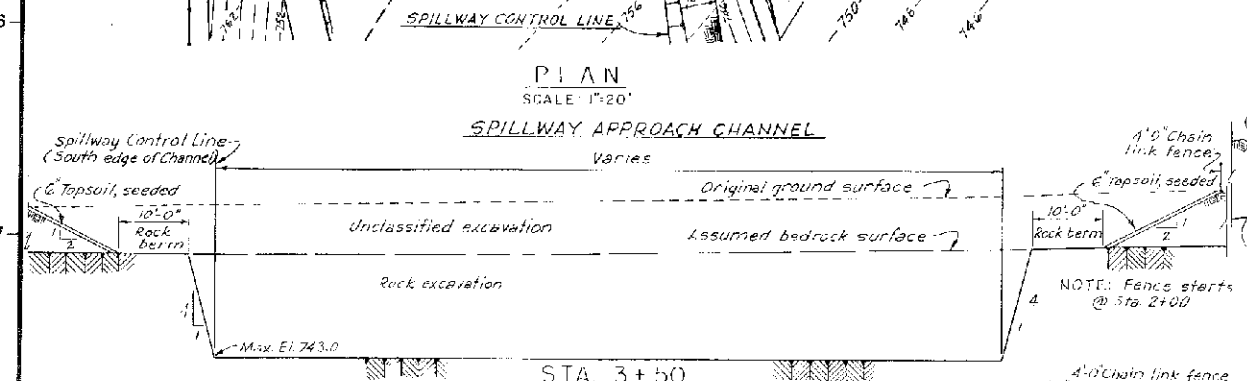
STA. 7+50

SCALE: 1"=10'

NORTH SIDE

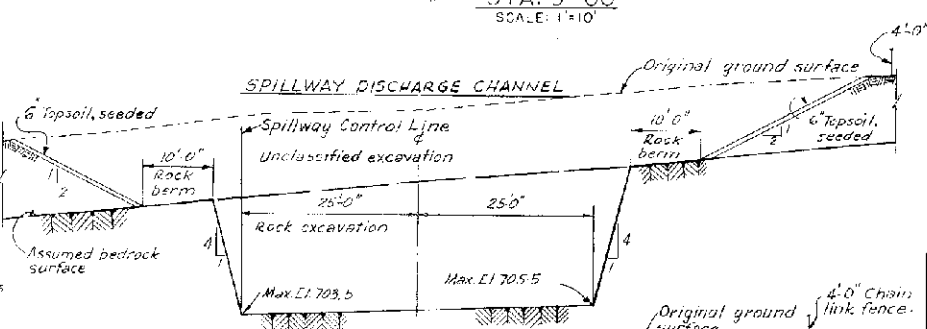
STA. 9+00

SCALE: 1"=10'



STA. 3+50

SCALE: 1"=10'

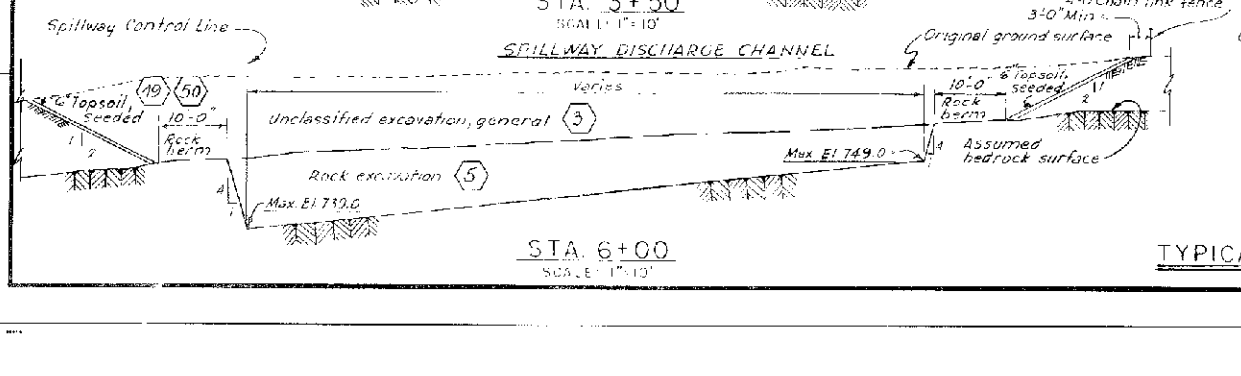


STA. 10+50

SCALE: 1"=10'

NOTES

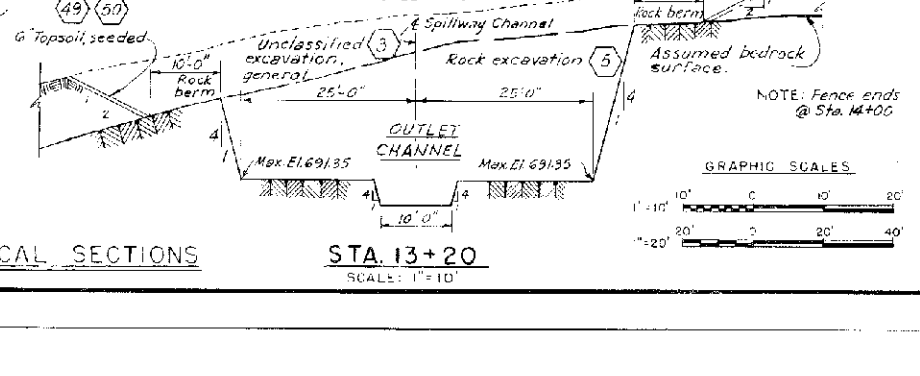
All rock excavation for Spillway Channel will be paid for under Item No. 5. For additional notes applying to this sheet, see Sheet 1C.



STA. 6+00

SCALE: 1"=10'

TYPICAL SECTIONS



STA. 13+20

SCALE: 1"=10'

GRAPHIC SCALES

1"=10' 10' 0 10' 20'

1"=20' 20' 0 20' 40'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.J.C.	C.A.	W.J.

SUBMITTED: CHIEF, LAYOUT SECTION

REVIEWED: PROJECT ENGINEER

APPROVED: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: APRIL 1964

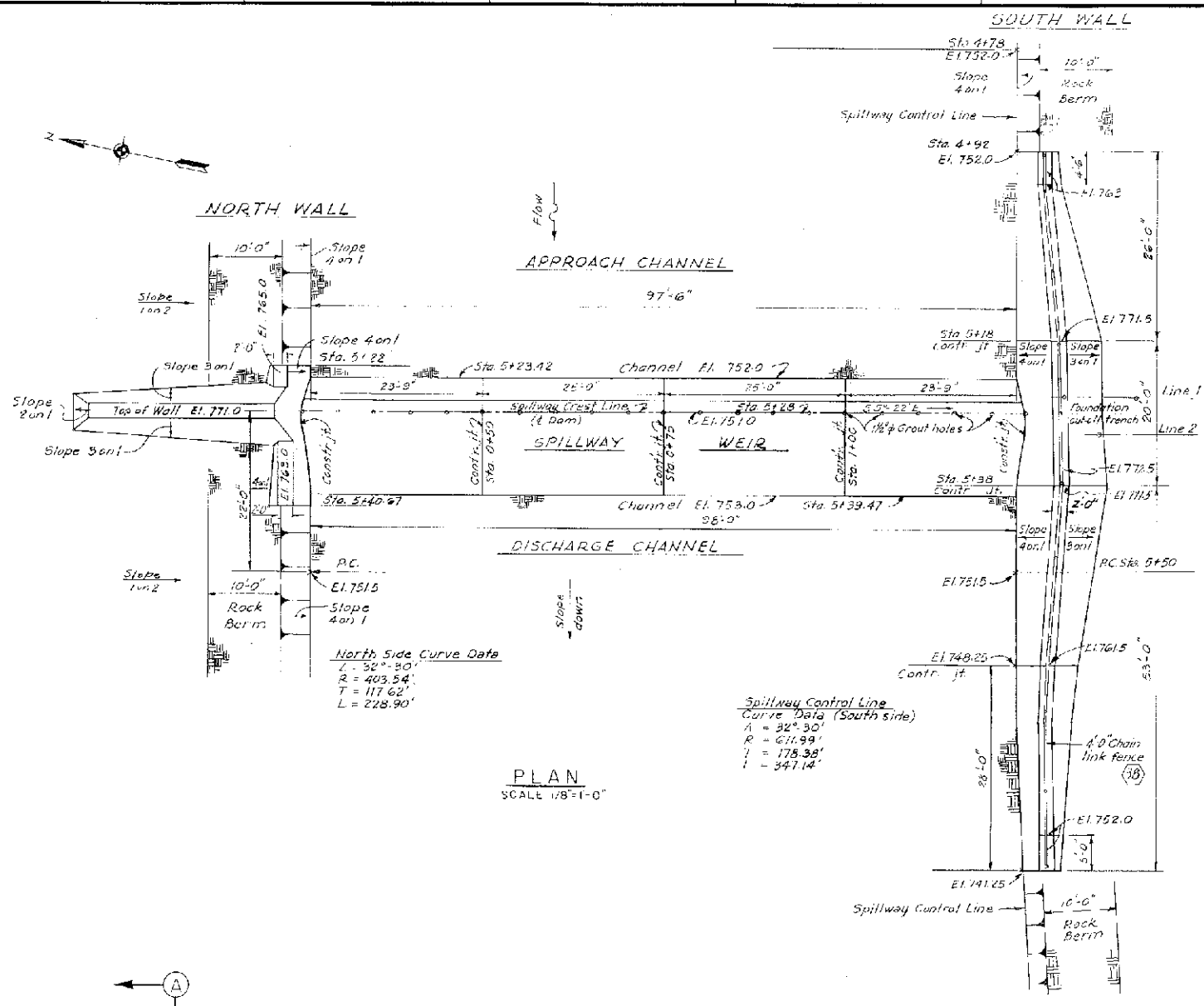
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
SPILLWAY
PLAN, PROFILE AND SECTIONS
CHICOPEE RIVER — MASSACHUSETTS

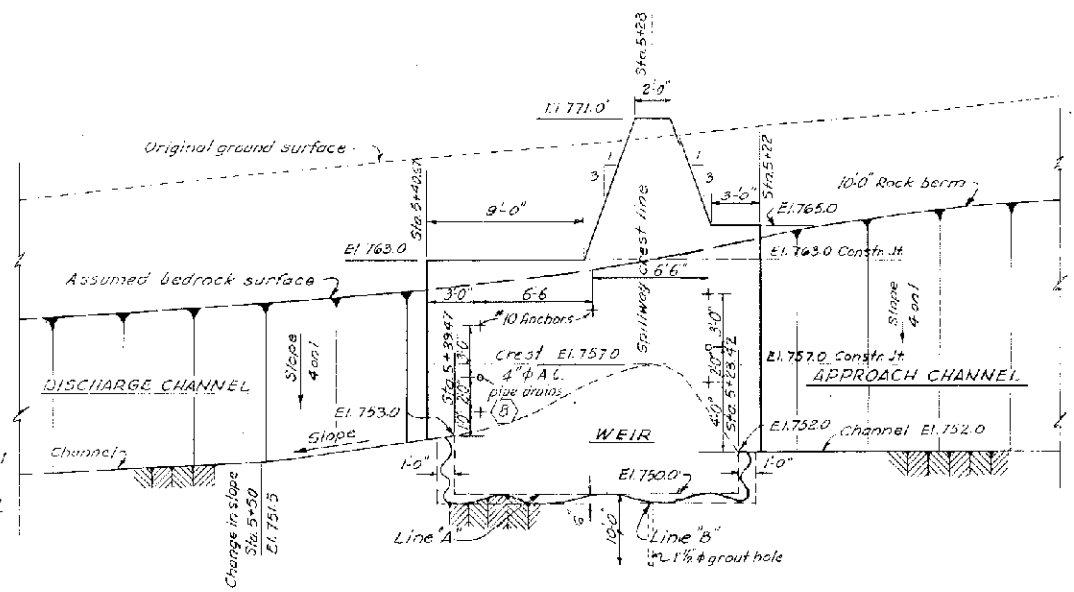
SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-018-64-43

DRAWING NUMBER
CON-8

SHEET 9

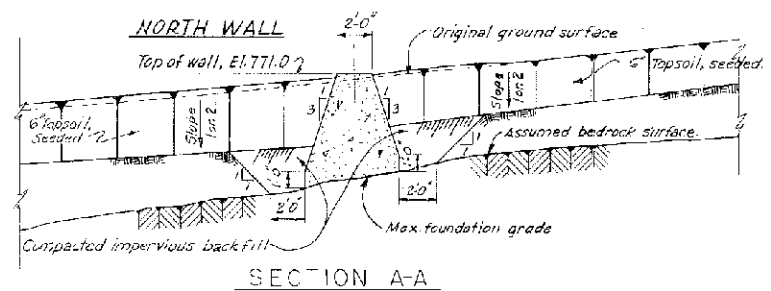
CORPS OF ENGINEERS — U. S. ARMY





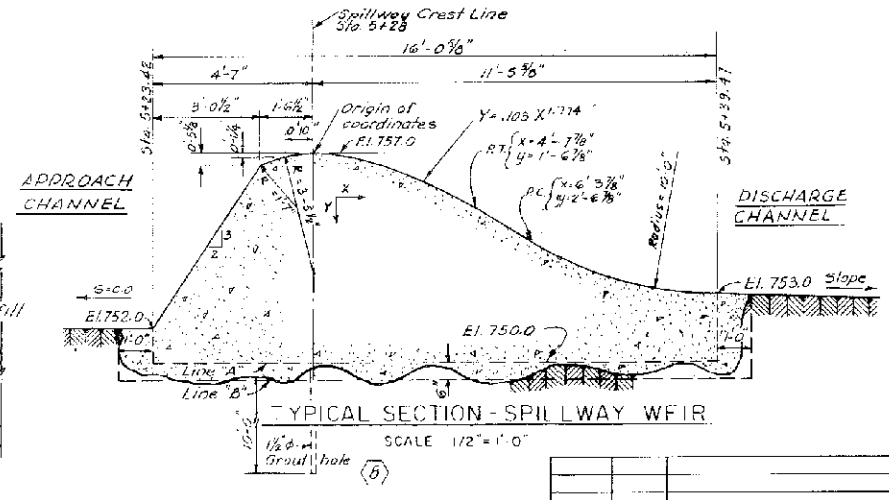
NORTH WALL - ELEVATION

SCALE 1/4"=1'-0"



SECTION A-A

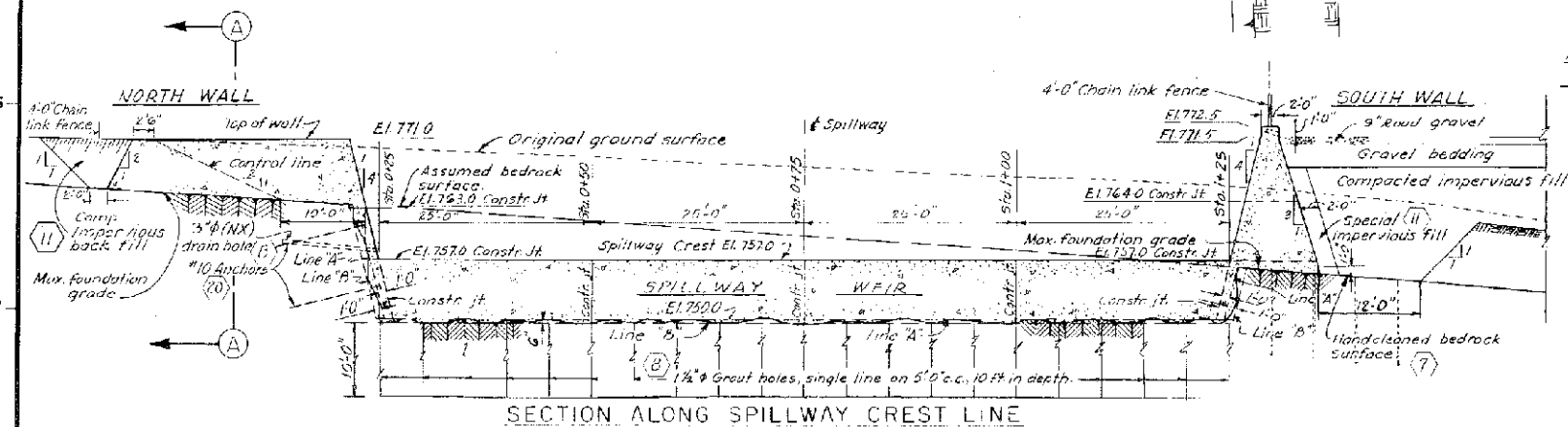
SCALE 1/4"=1'-0"



TYPICAL SECTION - SPILLWAY WEIR

SCALE 1/2"=1'-0"

COORDINATES TO SPILLWAY WEIR	
X	Y
1'-0"	0'-1/4"
2'-0"	0'-1-1/4"
3'-0"	0'-3-5/8"
4'-0"	1'-2⅜"
4'-7⅞"	1'-6⅞"



SECTION ALONG SPILLWAY CREST LINE

SCALE 1/8"=1'-0"

NOTES

All concrete for Weir, Retaining Wall, Channel Lining will be paid for under Item No 23.

Line "A" indicates minimum thickness of concrete.

Line "B" indicates payment line for rock excavation and concrete.

All exposed edges of concrete, including tops of walls to be formed 1"-45°.

All joints in the face of concrete walls against which fills are to be placed shall be made flush.

GRAPHIC SCALES

1/8"-1'-0" 4' 0 4' 8' 12' 16' 20'

1/4"-1'-0" 4' 0 4' 8'

1/2"=1'-0" 1' 0 1' 2' 3' 4' 5'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.J.C. DR. BY C.A. CK. BY M.S.

SUBMITTED: CHIEF, ARCHT. SECTION

REVIEWED: PROJECT ENGINEER

APPROVED: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE APR'L 1964

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
SPILLWAY
CONCRETE DETAILS NO. 1

CHICOPEE RIVER MASSACHUSETTS

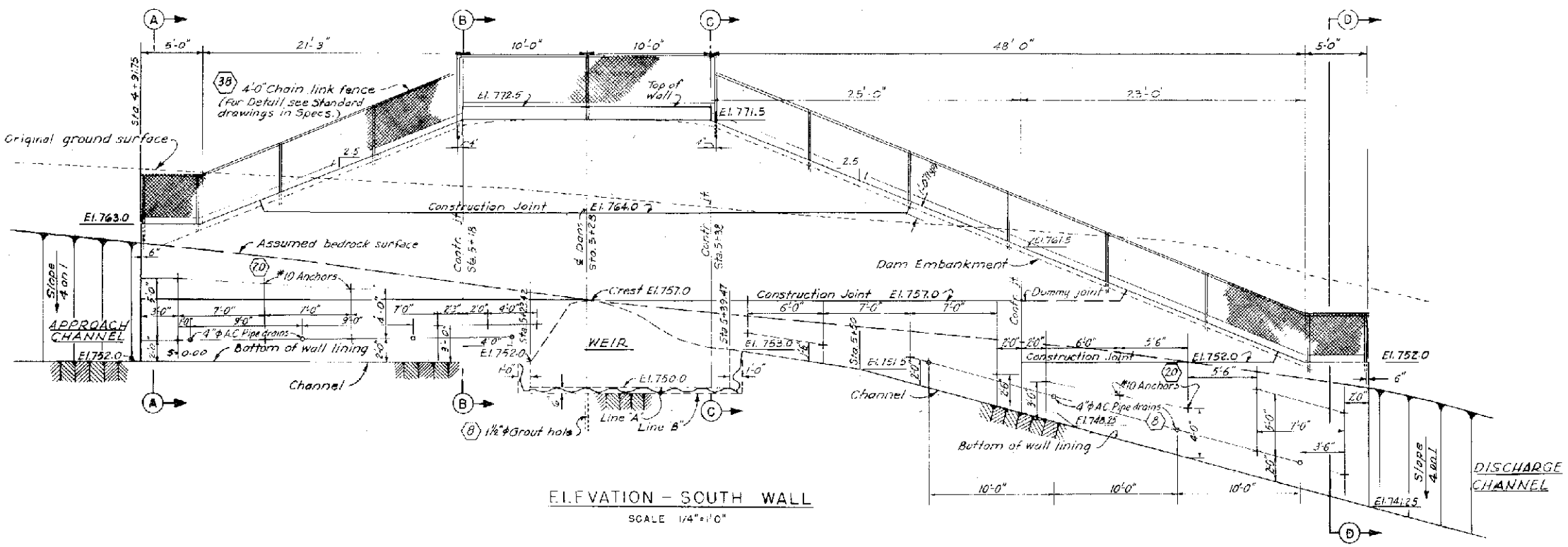
SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-64-45

DRAWING NUMBER CON - 8

SHEET 10

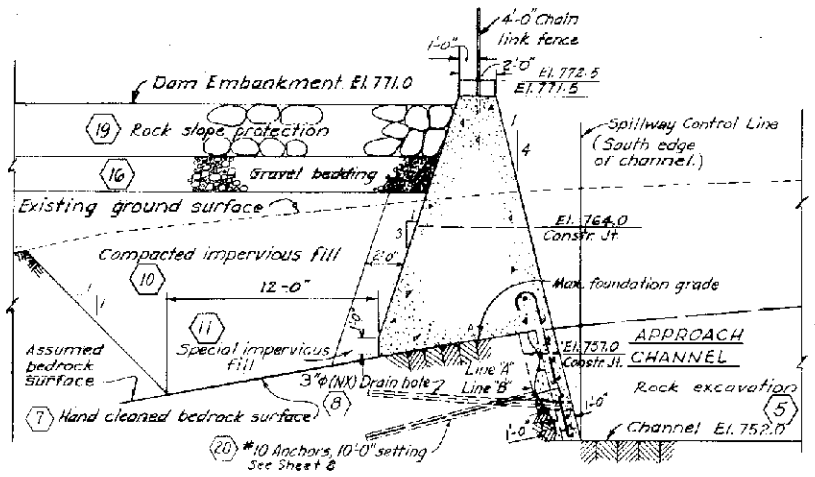
4316.156

CORPS OF ENGINEERS — U. S. ARMY



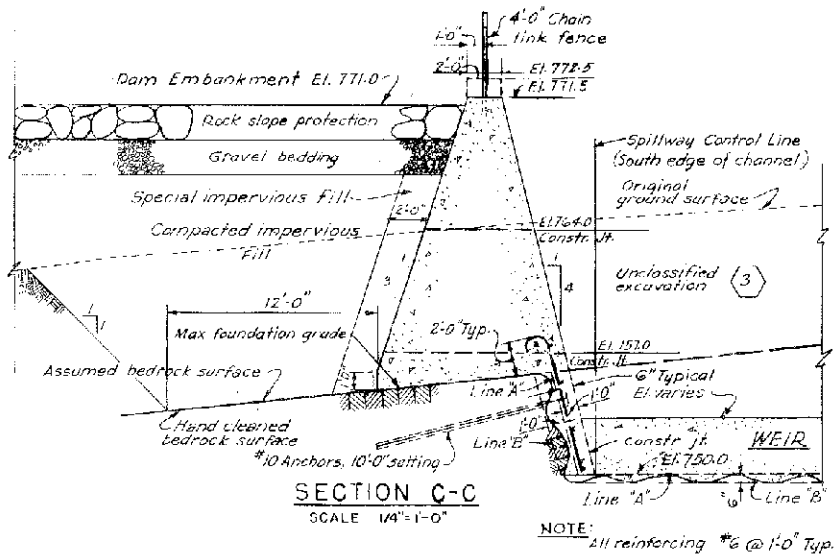
ELEVATION – SOUTH WALL

SCALE 1/4"=1'-0"



SECTION B-B

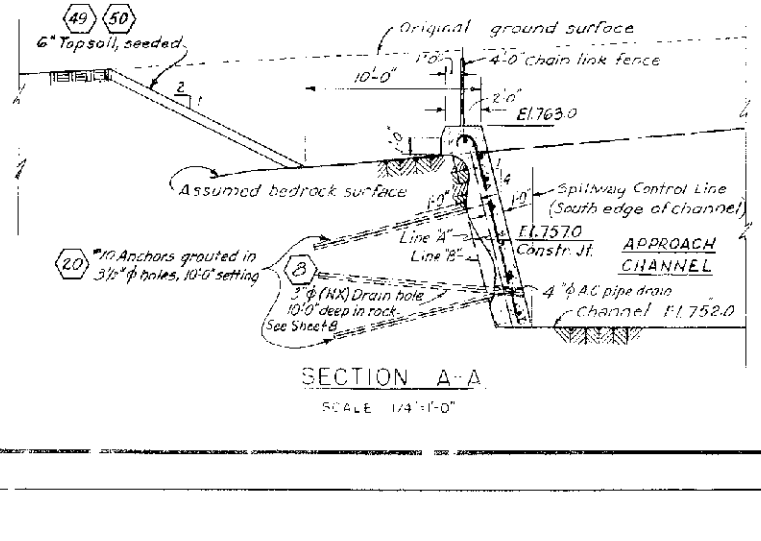
SCALE 1/4"=1'-0"



SECTION C-C

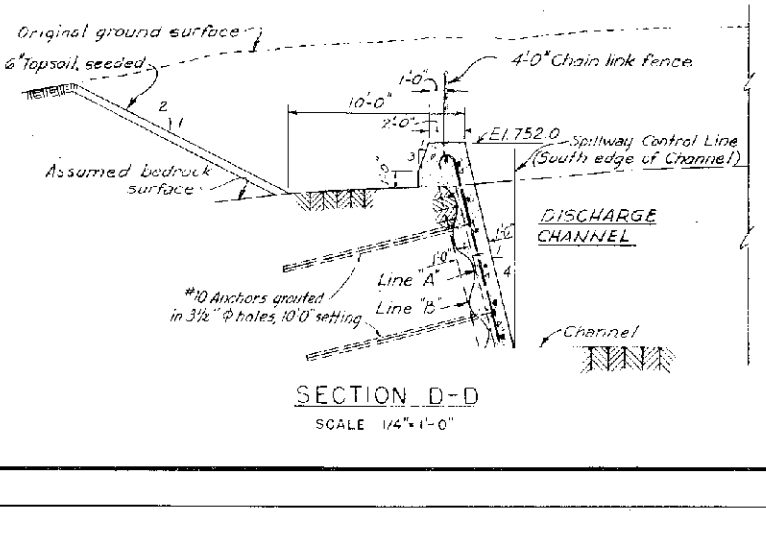
SCALE 1/4"=1'-0"

NOTE: All reinforcing #6 @ 1'-0" Typ.



SECTION A-A

SCALE 1/4"=1'-0"



SECTION D-D

SCALE 1/4"=1'-0"

GRAPHIC SCALE

1/4"=1'-0"

NOTES

For notes applying to this sheet, see Sheets 8 & 10.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CH. BY
J.J.C.	C.A.	W.J.O.

SUBMITTED: CHIEF, LAYOUT SECTION

REVIEWED: PROJECT ENGINEER

APPROVAL: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: APRIL 1964

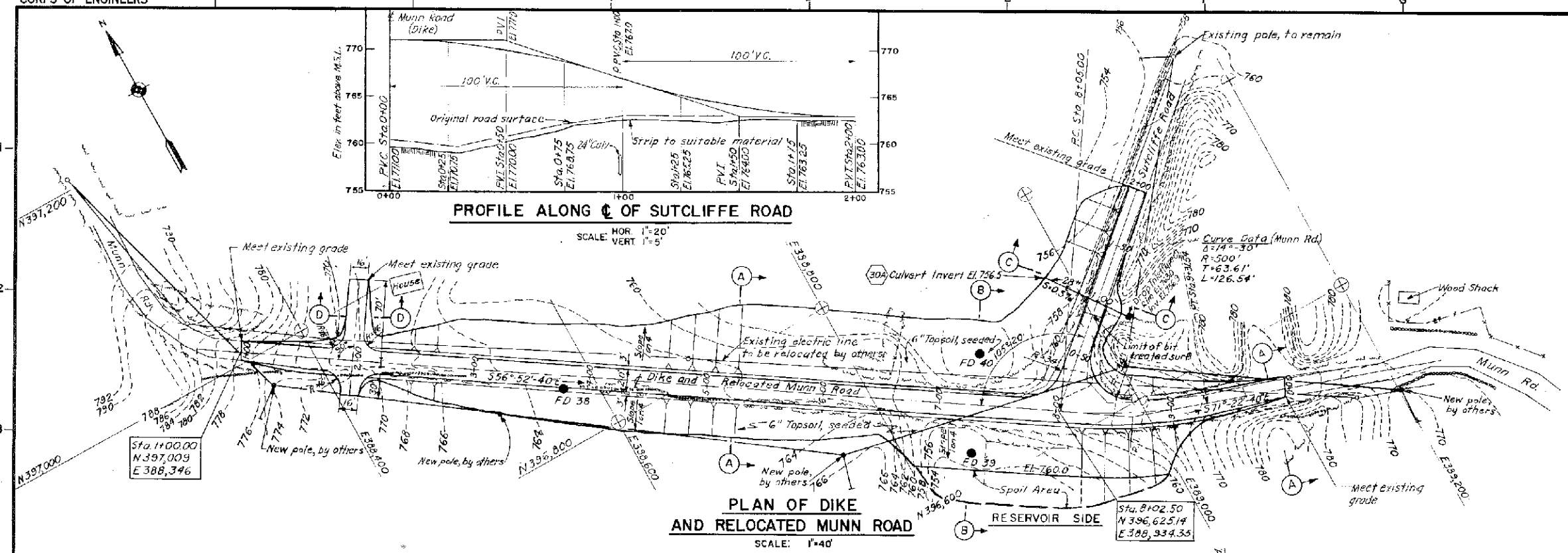
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
SPILLWAY
CONCRETE DETAILS NO. 2
CHICOPEE RIVER — MASSACHUSETTS

SCALE: 1/4"=1'-0" | SPEC. NO. ENG. 19-015-64-43

DRAWING NUMBER
CON-8

SHEET 11

CORPS OF ENGINEERS — U. S. ARMY

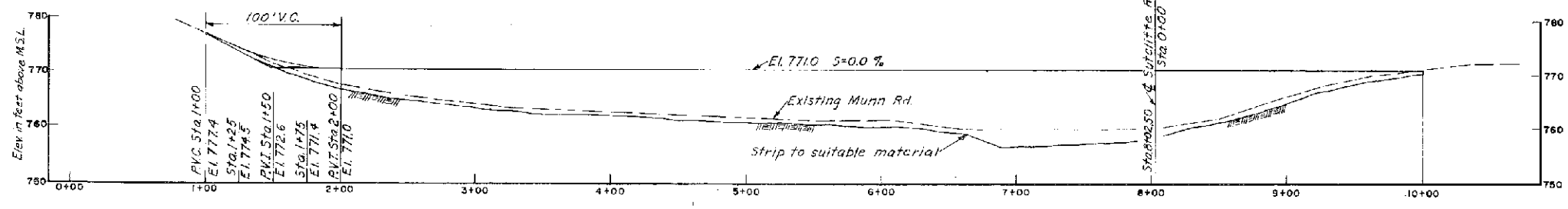


PROFILE ALONG ℄ OF SUTCLIFFE ROAD

SCALE: HOR. 1"=20'
VERT. 1"=5'

PLAN OF DIKE AND RELOCATED MUNN ROAD

SCALE: 1"=40'

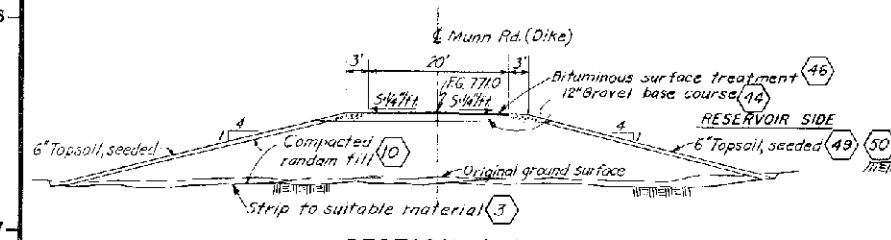


PROFILE ALONG ℄ OF DIKE AND RELOCATED MUNN ROAD

SCALE: HOR. 1"=40'
VERT. 1"=10'

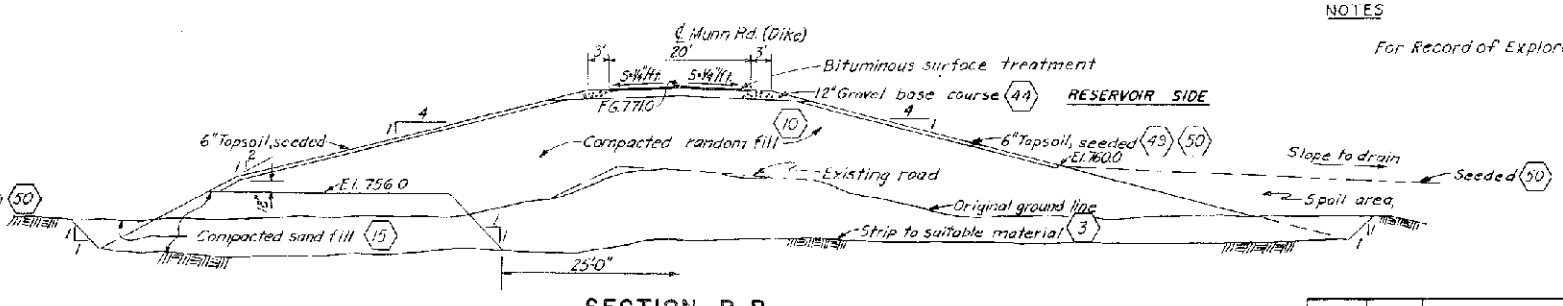
NOTES

For Record of Explorations, see Sheet 23.



SECTION A-A

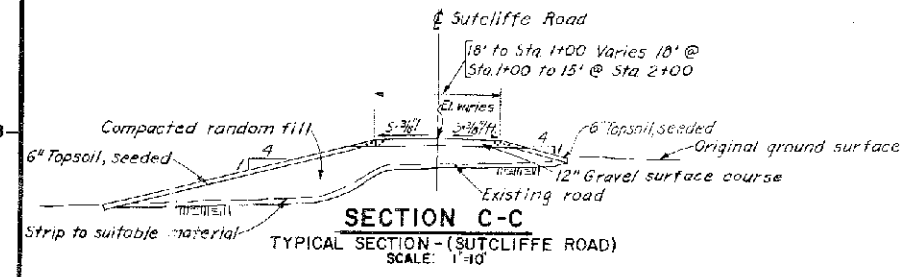
SCALE: 1"=10'



SECTION B-B

(TYPICAL FILL SECTION FROM STA. 6+90 TO STA. 7+90)

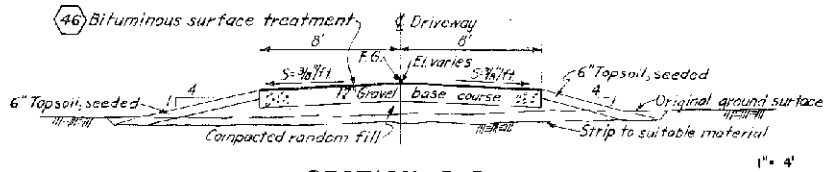
SCALE: 1"=10'



SECTION C-C

TYPICAL SECTION - (SUTCLIFFE ROAD)

SCALE: 1"=10'



SECTION D-D

SCALE: 1" = 4'

GRAPHIC SCALES

1"= 4'
1"= 10'
1"= 20'
1"= 40'
1"= 5'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

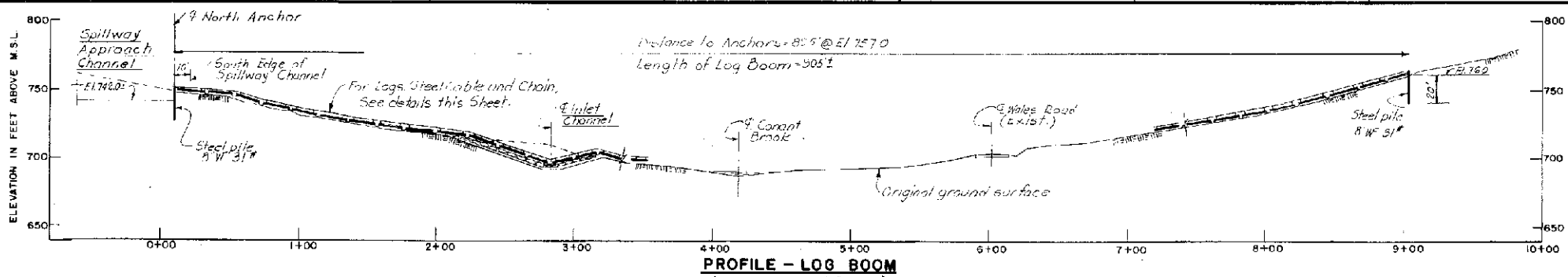
DES. BY H.D.G.	DR. BY E.J.K.	CK. BY JWJ

SUBMITTED: CHIEF, OPERATIONS SECTION
REVIEWED: PROJECT ENGINEER
APPROVED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION
DATE APRIL 1964

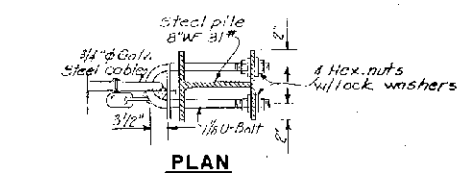
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
DIKE
PLAN, PROFILES AND SECTIONS
CHICOPEE RIVER — MASSACHUSETTS

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER CON-8
SHEET 12

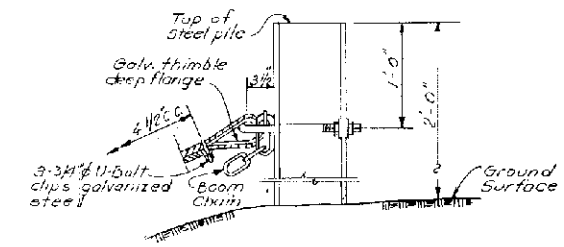
CORPS OF ENGINEERS — U. S. ARMY



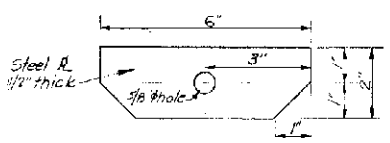
PROFILE – LOG BOOM
(LOOKING UPSTREAM)
SCALE 1" = 40' (40)



PLAN
SCALE 1/4" = 1'-0"

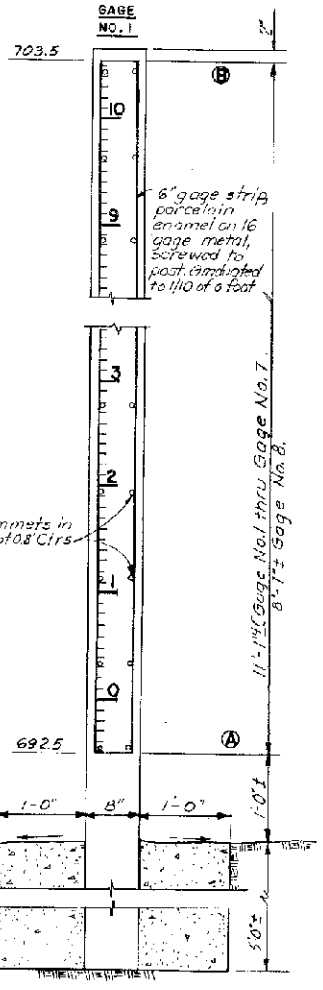


TYPICAL PILE CONNECTION
SCALE 1/2" = 1'-0"

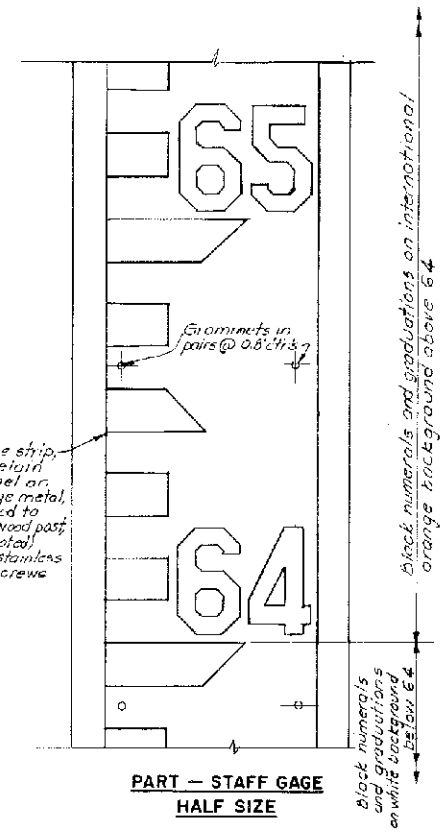


TOGGLE DETAIL
SCALE 6" = 1'-0"

NOTE
Cable, chain, eyebolts and connections shall be given a mastic coating



TYPICAL STAFF GAGE DETAILS
NOT TO SCALE



PART – STAFF GAGE
HALF SIZE

FEDERAL STANDARD NO. 595 - COLORS
INTERNATIONAL ORANGE – 12197
WHITE – 17875
BLACK – 17038

NOTES
Staff graduations are .10 of a foot.
Porcelain enamel on 16 gage metal for all gages, and fastened with stainless steel screws to 6"x8" wood post (creosoted)

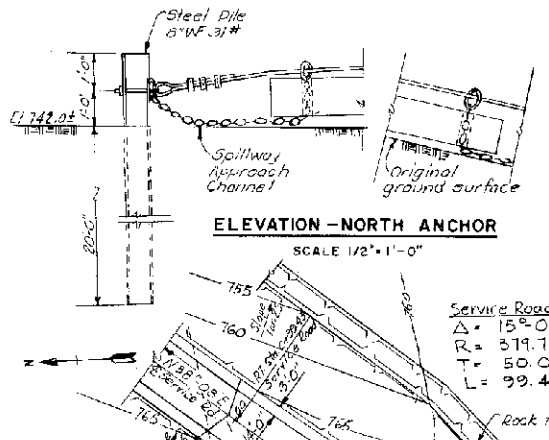
TABLE OF STAFF GAGE PERTINENT DATA

GAGE NO	(A) ELEV. IN FT. M.S.L.	(A) GRADUATION IN FEET	(B) ELEV. IN FT. M.S.L.	(B) GRADUATION IN FEET
1	692.5	−0.5	703.5	10.5
2	702.5	9.5	713.5	20.5
3	712.5	19.5	723.5	30.5
4	722.5	29.5	733.5	40.5
5	732.5	39.5	743.5	50.5
6	742.5	49.5	753.5	60.5
7	752.5	59.5	763.5	70.5
8	762.5	69.5	771.0	78.0

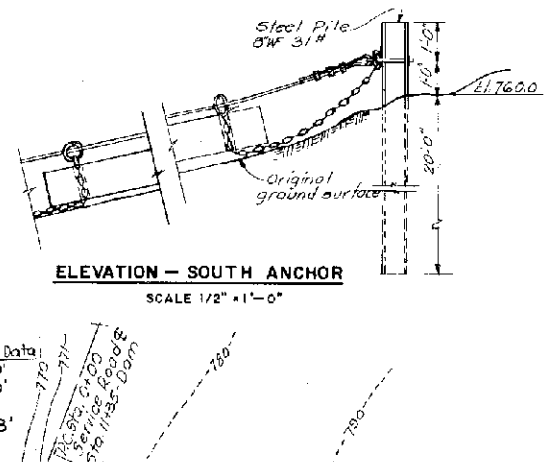
1 2 3 4 5
6 7 8 9 10

Numerals to be 3" high

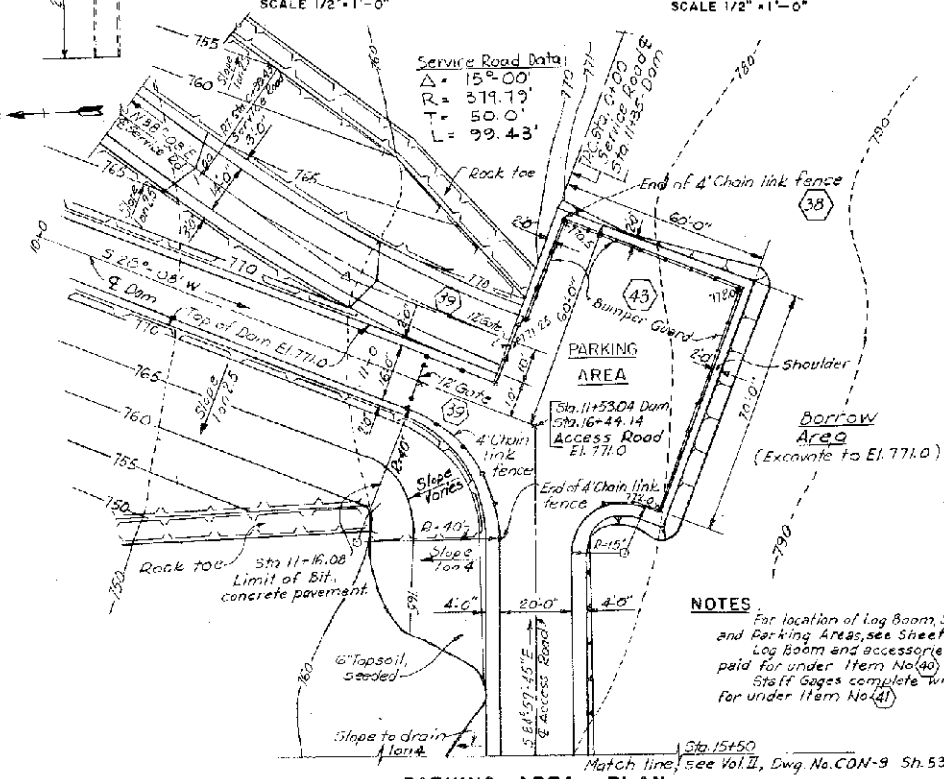
TYPICAL STAFF GAGE NUMERALS AND GRADUATIONS
HALF SIZE (41)



ELEVATION – NORTH ANCHOR
SCALE 1/2" = 1'-0"

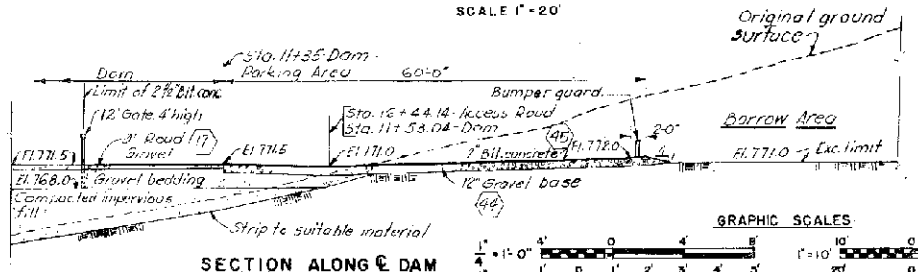


ELEVATION – SOUTH ANCHOR
SCALE 1/2" = 1'-0"



PARKING AREA – PLAN
SCALE 1" = 20'

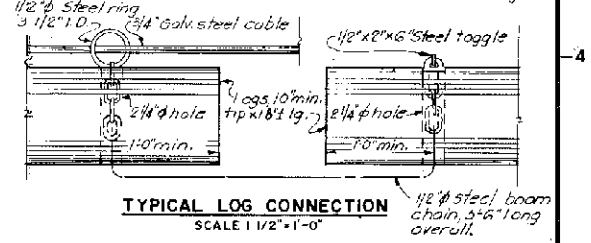
NOTES
For location of Log Boom, Staff Gages and Parking Areas, see Sheet No. 2.
Log Boom and accessories will be paid for under Item No. (40)
Staff Gages complete will be paid for under Item No. (41)



SECTION ALONG ℄ DAM
SCALE 1" = 10'

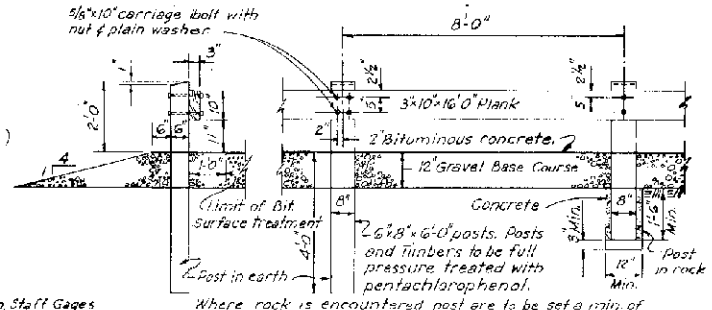
PARKING AREA

GRAPHIC SCALES
1" = 1'-0"
1/2" = 1'-0"
1 1/2" = 1'-0"
1"=10'
1"=20'
1"=40'
6"=12"



TYPICAL LOG CONNECTION
SCALE 1 1/2" = 1'-0"

(40) LOG BOOM DETAILS



(43) BUMPER GUARD DETAIL
SCALE 1/2" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

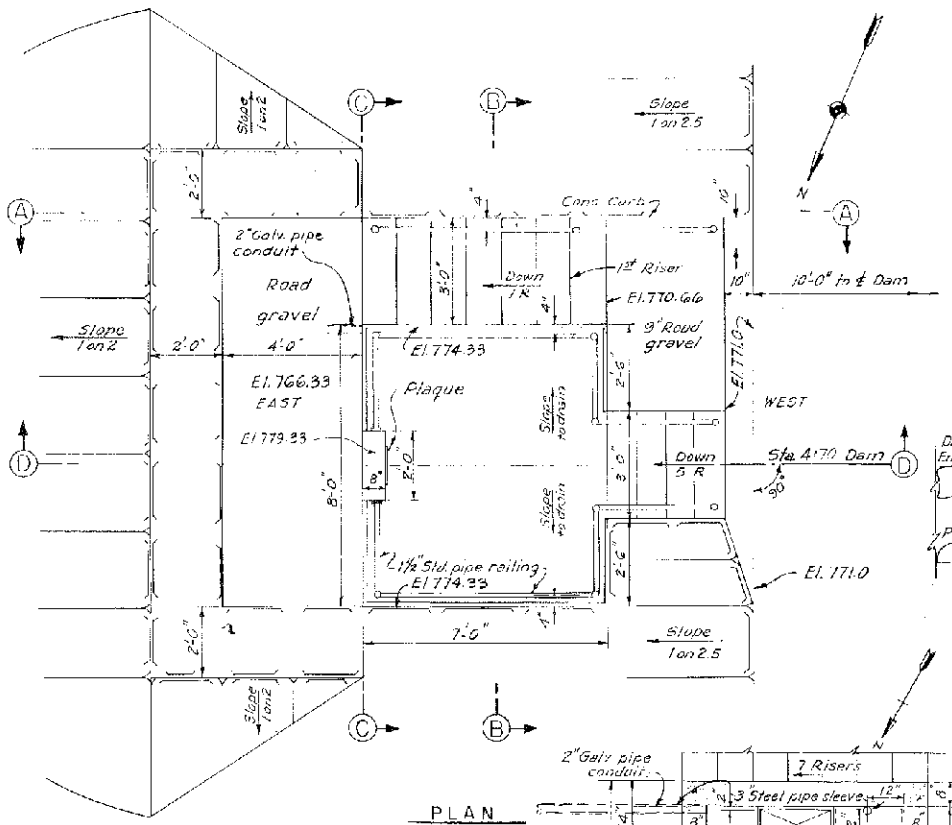
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.J.C. | DR. BY A.J.H. | CK. BY M.J.S.
SUBMITTED: Chief, Hydr. Section
REVIEWED: Project Engineer
APPROVED: Chief, Design Branch
APPROVED: Chief, Engineering Division
DATE: APRIL 1964

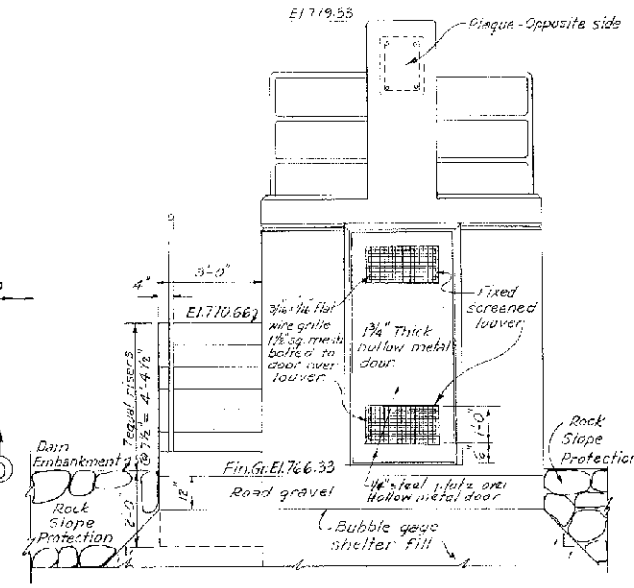
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
LOG BOOM, STAFF GAGES AND PARKING AREA
CHICOPEE RIVER, MASSACHUSETTS

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER CON-8
SHEET 13

CORPS OF ENGINEERS — U.S. ARMY

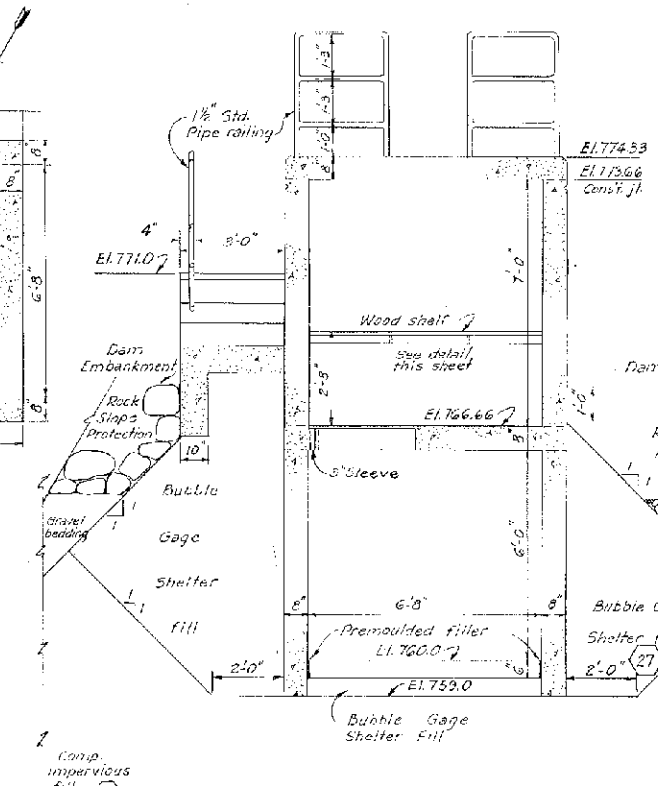


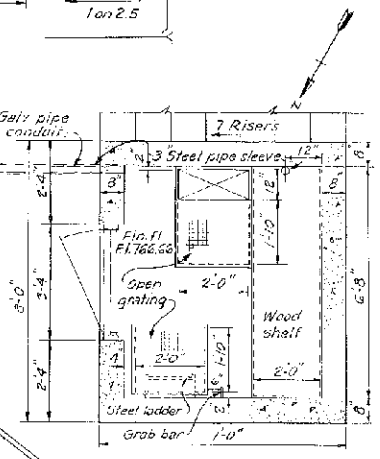
PLAN
SCALE: 1/2"=1'-0"



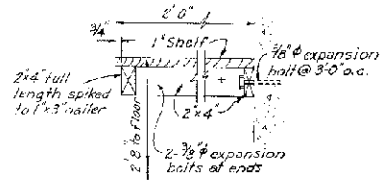
SECTION C-C EAST ELEVATION
SCALE: 1/2"=1'-0"

SECTION A-A
SCALE: 1 1/2"=1'-0"

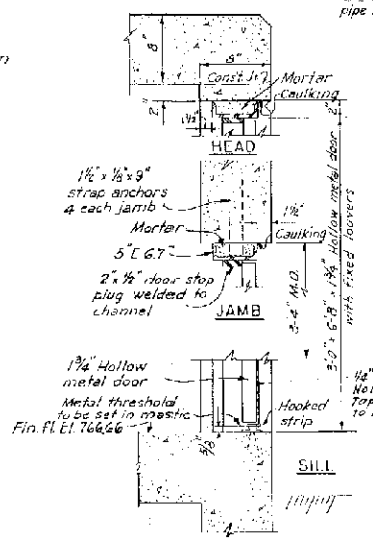




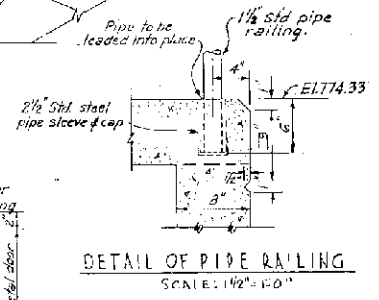
FLOOR PLAN
SCALE: 1/2"=1'-0"



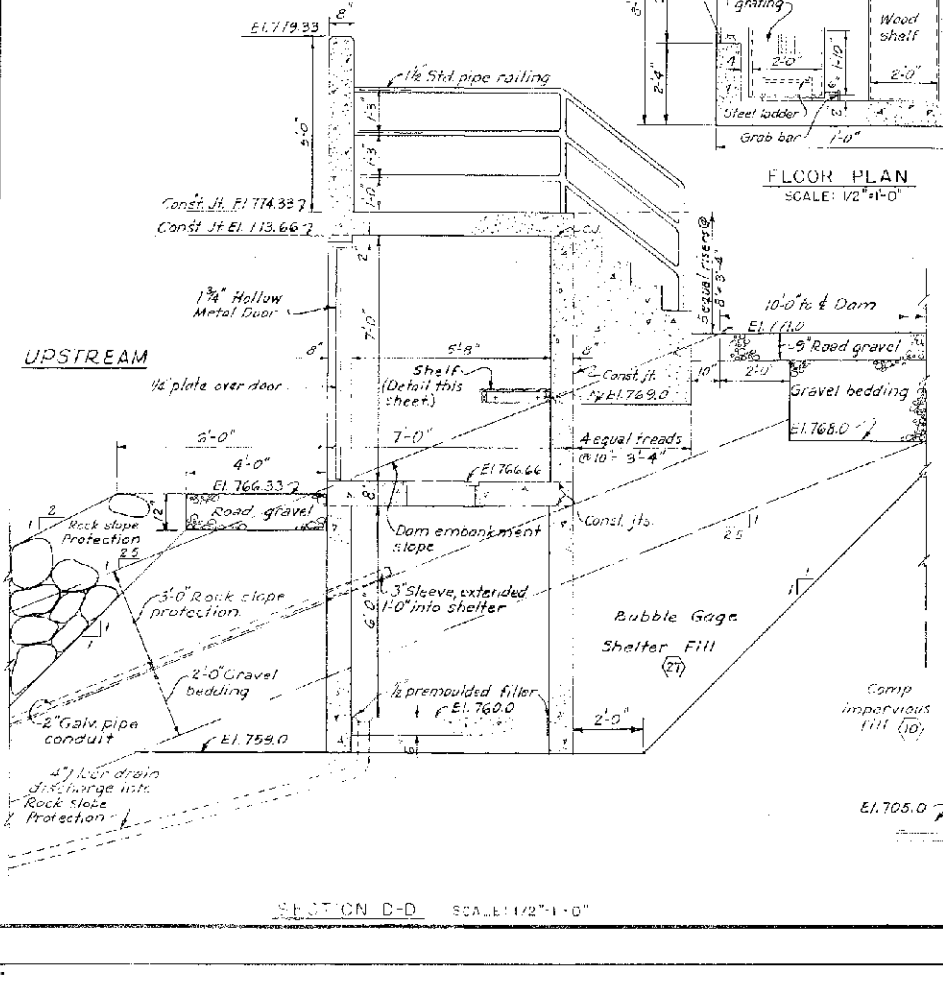
SHELF DETAIL
SCALE: 1 1/2"=1'-0"



ENTRANCE DOOR DETAIL
SCALE: 1 1/2"=1'-0"

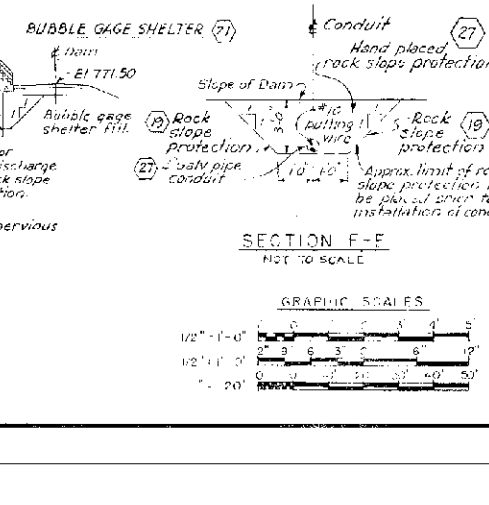


DETAIL OF PIPE RAILING
SCALE: 1 1/2"=1'-0"



SECTION D-D SCALE: 1/2"=1'-0"

SECTION ALONG PIPE CONDUIT
SCALE: 1" = 20'



SECTION B-B
SCALE: 1/2"=1'-0"

SECTION F-F
NOT TO SCALE

GRAPHIC SCALES
1/2" = 1'-0"
1" = 20'

NOTES.

All work in connection with the construction of the Bubble Gage Shelter complete will be paid for under item No. 21
For steel reinforcement, and miscl metals, see Sheet 13
All exposed edges of concrete to be formed 1" x 45°

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.J.C. | DR. BY C.A. | CK. BY M.S.

SUBMITTED: CHIEF, LAYOUT SECTION

REVIEWED: PROJECT ENGINEER

APPROVED: CHIEF, DESIGN BRANCH

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
BUBBLE GAGE SHELTER
DETAILS

CHICOPEE RIVER — MASSACHUSETTS

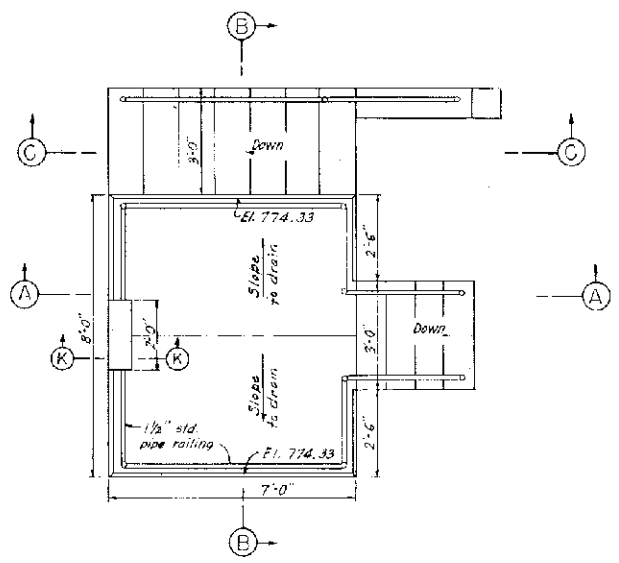
APPROVED: CHIEF, ENGINEERING DIVISION — DATE: APRIL 1964

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43

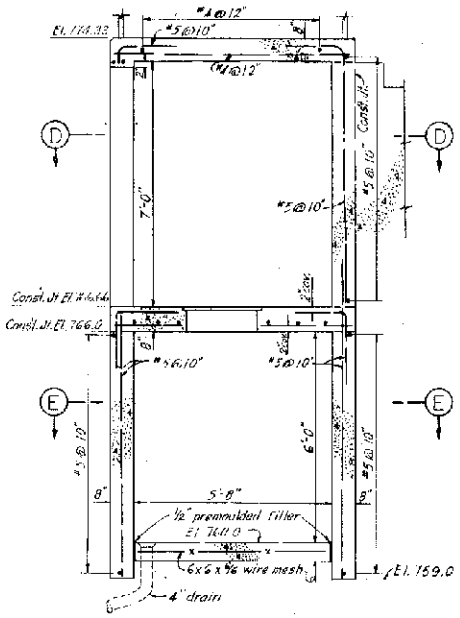
DRAWING NUMBER
CON-8

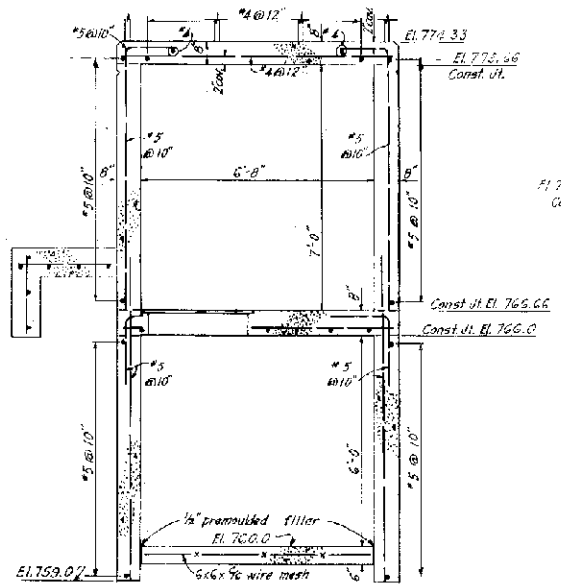
SHEET 14

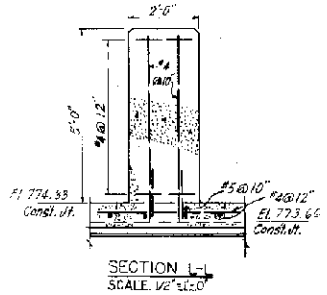
CORPS OF ENGINEERS — U. S. ARMY



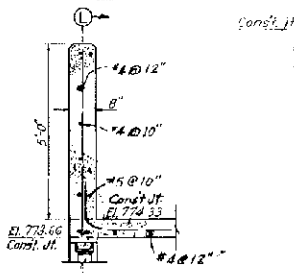
ROOF PLAN
SCALE 1/2"=1'-0"

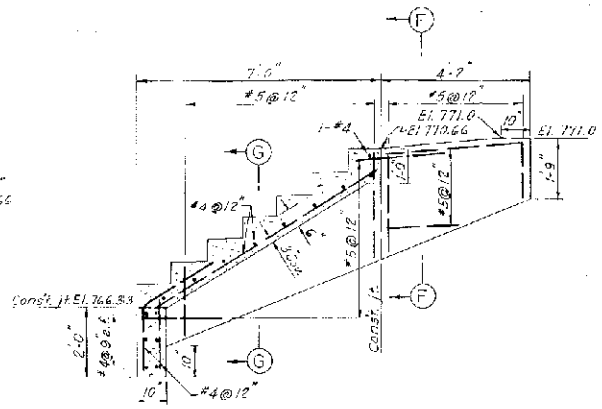






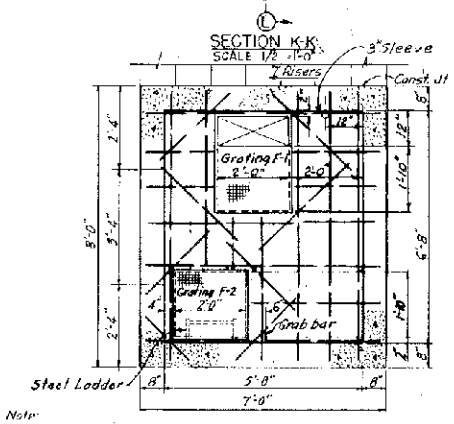
SECTION L-L
SCALE 1/2"=1'-0"





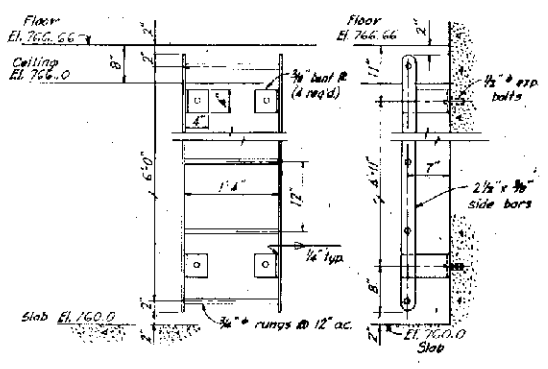
SECTION C-C
SCALE 1/2"=1'-0"

SECTION K-K
SCALE 1/8"=1'-0"

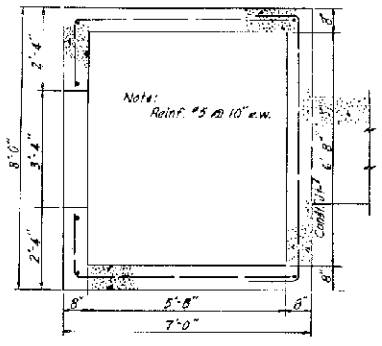


FLOOR PLAN
(EL. 766.66)
SCALE 1/2"=1'-0"

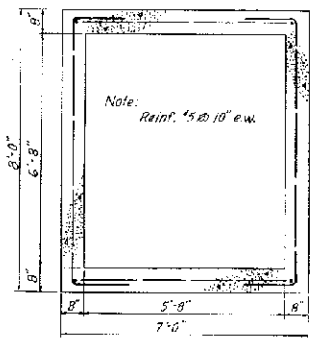
Note:
All floor reinf. #4 bars spaced at 12" o.c.
Diagonals around openings are #4 bars.



STEEL LADDER
NO SCALE
(ONE REQ'D.)

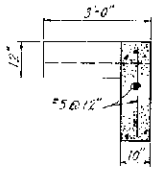


SECTION D-D
SCALE 1/2"=1'-0"

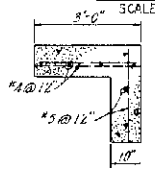


SECTION E-E
SCALE 1/2"=1'-0"

SECTION A-A
SCALE 1/2"=1'-0"

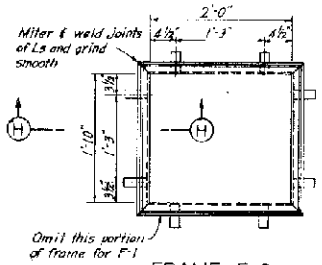


SECTION B-B
SCALE 1/2"=1'-0"

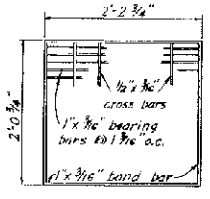


SECTION F-F
SCALE 1/2"=1'-0"

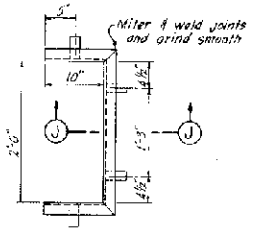
SECTION G-G
SCALE 1/2"=1'-0"



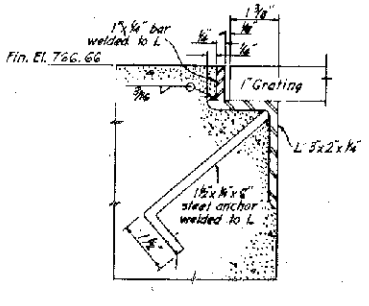
FRAME F-2
FR. F-1 SIMILAR EXCEPT AS NOTED
SCALE 1"=1'-0"
(TWO REQUIRED)



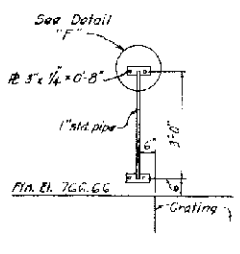
F-1 & F-2
GRATING
SCALE 1"=1'-0"
(TWO REQ'D.)



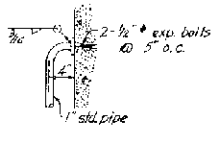
FRAME
SCALE 1"=1'-0"
(ONE REQ'D.)



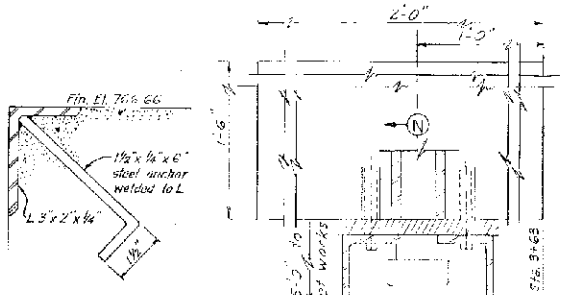
SECTION H-H
HALF SIZE



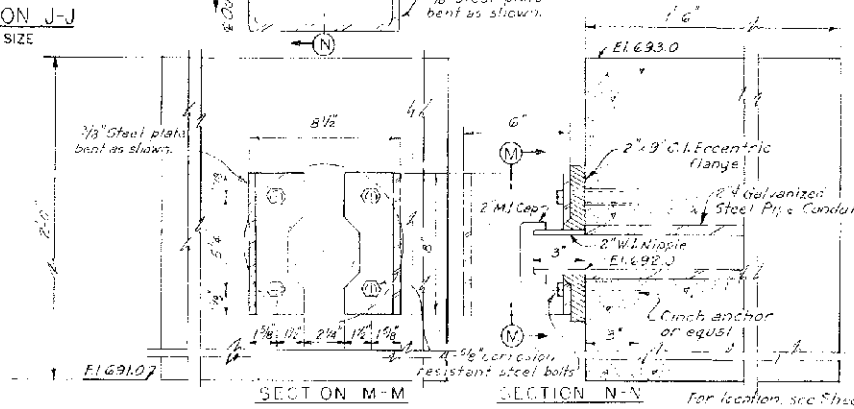
GRAB BAR
(ONE REQ'D.)



DETAIL "F"
SCALE 1"=1'-0"



SECTION J-J
HALF SIZE



SECTION M-M

SECTION N-N

For location, see Sheet 6.

GAGE INLET
SCALE: 3"=1'-0"

GRAPHIC SCALE
1/2"=1'-0" 0 1' 2' 3' 4'
3" = 1'-0" 0 3" 6" 9"
1" = 1'-0" 0 1' 2' 3'

NOTES:

For concrete details, see sheet No. 14
For additional notes applying to this sheet, see sheet 14

REVISION	DATE	DESCRIPTION	BY

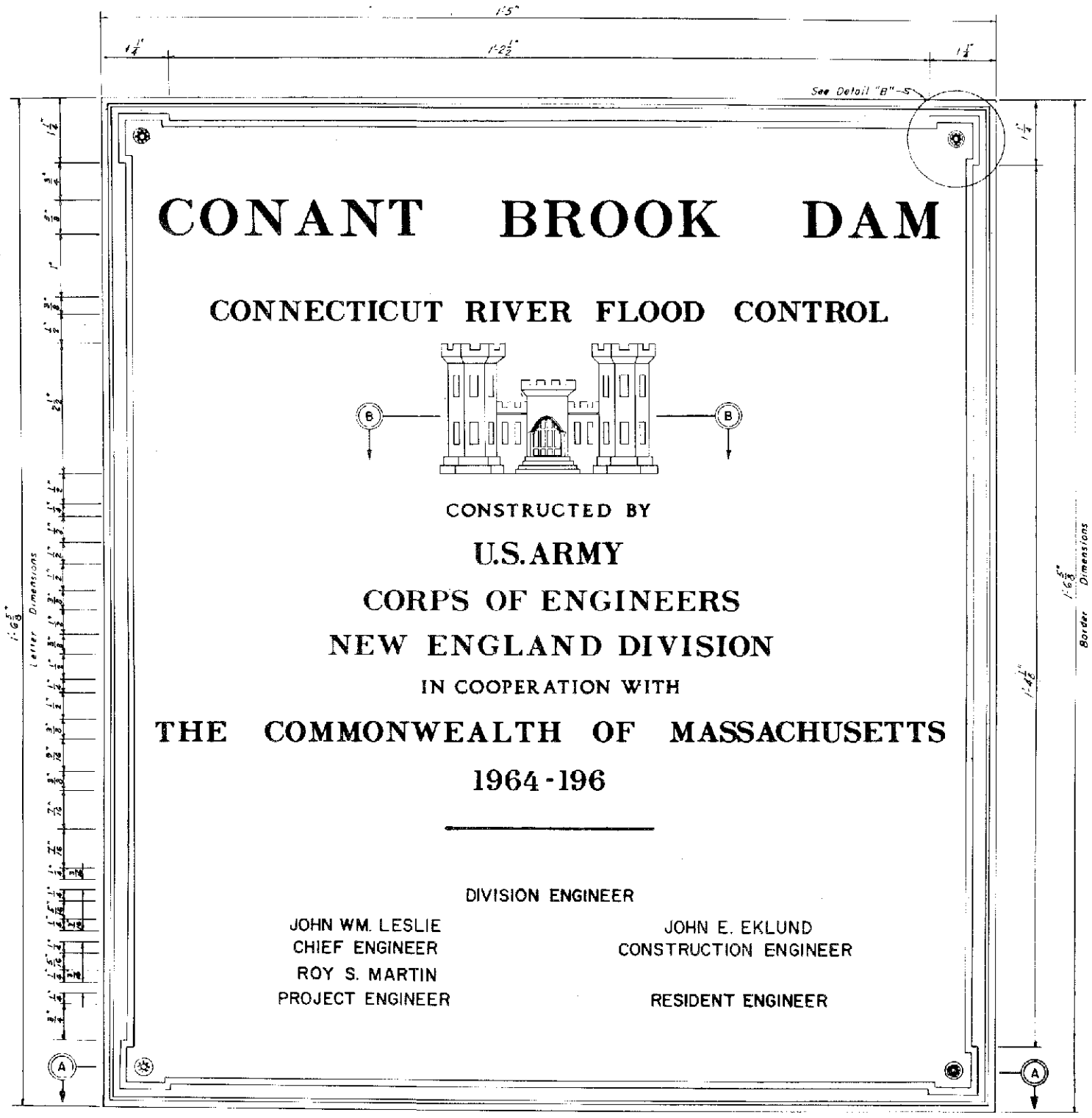
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.P.M.	DR. BY H.P.M.	CK. BY
SUBMITTED:		
CHIEF, CIVIL DESIGN SECTION		
REVIEWED:		
PROJECT ENGINEER		
APPROVED		
CHIEF, DESIGN BRANCH		

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
BUBBLE GAGE SHELTER
STEEL REINFORCEMENT
CHICOPEE RIVER — MASSACHUSETTS

APPROVED — DATE APRIL 1964
CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON-8
SHEET 15



CONANT BROOK DAM

CONNECTICUT RIVER FLOOD CONTROL

CONSTRUCTED BY

U.S. ARMY

CORPS OF ENGINEERS

NEW ENGLAND DIVISION

IN COOPERATION WITH

THE COMMONWEALTH OF MASSACHUSETTS

1964-196

DIVISION ENGINEER

JOHN WM. LESLIE
CHIEF ENGINEER

ROY S. MARTIN
PROJECT ENGINEER

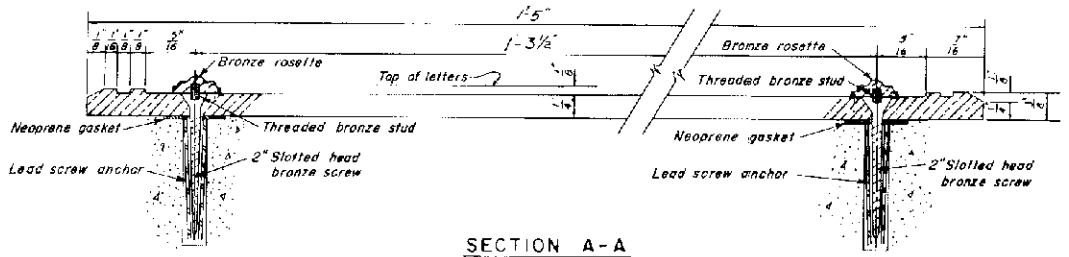
JOHN E. EKLUND
CONSTRUCTION ENGINEER

RESIDENT ENGINEER

PLAQUE

SCALE: FULL SIZE

Material	*Cast bronze*
Border.	*Raised and polished to a bright finish with beveled edge*
Background	*Grain or sand finish*
Letters.	*Roman style, raised a minimum of 1/8", hand tooled, flat faced and polished to a bright finish. Manufacturers' standard letter styles may be used subject to the approval of the Division Engineer.*

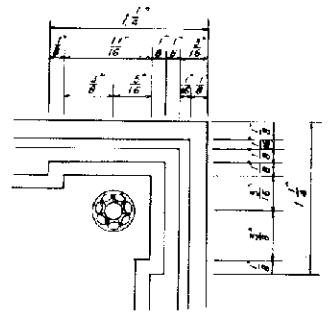


SECTION A-A
NOT TO SCALE

NOTE:
Threaded stud shall be dipped in an approved epoxy adhesive immediately prior to being inserted into the rosette and screw.



SECTION B-B
NOT TO SCALE



DETAIL "B"
NOT TO SCALE

NOTE:

Names of Division Engineer and Resident Engineer will be furnished at a later date

All costs of furnishing and installing the plaque will be paid for under Item No. 27.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.J.C.	E.K.	M.J.

SUBMITTED: CHIEF, CIV. ENG. SECTION
REVIEWED: PROJECT ENGINEER
APPROVED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
PLAQUE
SECTIONS AND DETAIL
CHICOPEE RIVER MASSACHUSETTS

DATE APRIL 1964

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-42

DRAWING NUMBER
CON-8

SHEET 16

8

CORPS OF ENGINEERS

U.S. ARMY

PLAN

1" = 40'

40' 0 40' 80'

LEGEND

- FD — Foundation Test Boring
- FT — Foundation Test Pit
- FTT — Foundation Test Trench
- Bedrock Outcrop
- Boulder
- Location and direction of view for Geologic-Log Section
- N 17° W / 70°-85° W — Strike and dip of foliation

NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval is 2 feet.
For Record of Foundation Explorations, see Sheet Nos.

For Geologic-Log Sections, See Sheet Nos.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
C.A.M.	R.D.B.	R.C.G.

SUBMITTED: CHIEF, ENGINEERING DIVISION

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, FDN. & MAT'LS. BRANCH

APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN

CONANT BROOK DAM

PLAN OF FOUNDATION EXPLORATIONS

CHICOPEE RIVER, MASSACHUSETTS

DATE APRIL 1964

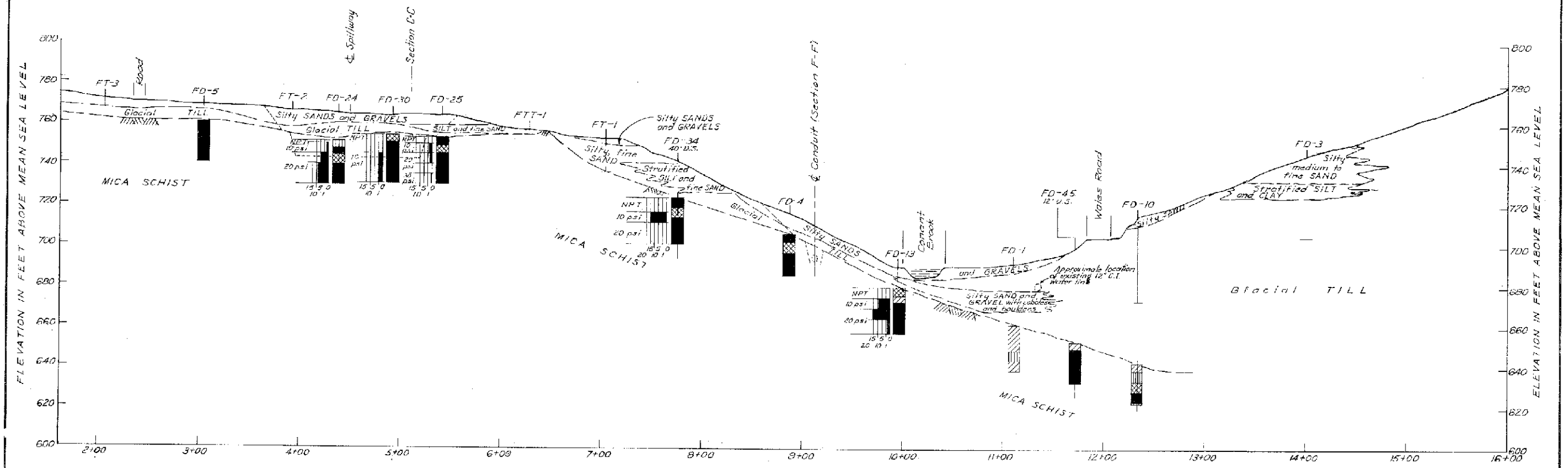
SCALE: 1" = 40' | SPEC. NO. CIV. ENG. 19-016-64-43

DRAWING NUMBER
CON-8

SHEET 17

CORPS OF ENGINEERS

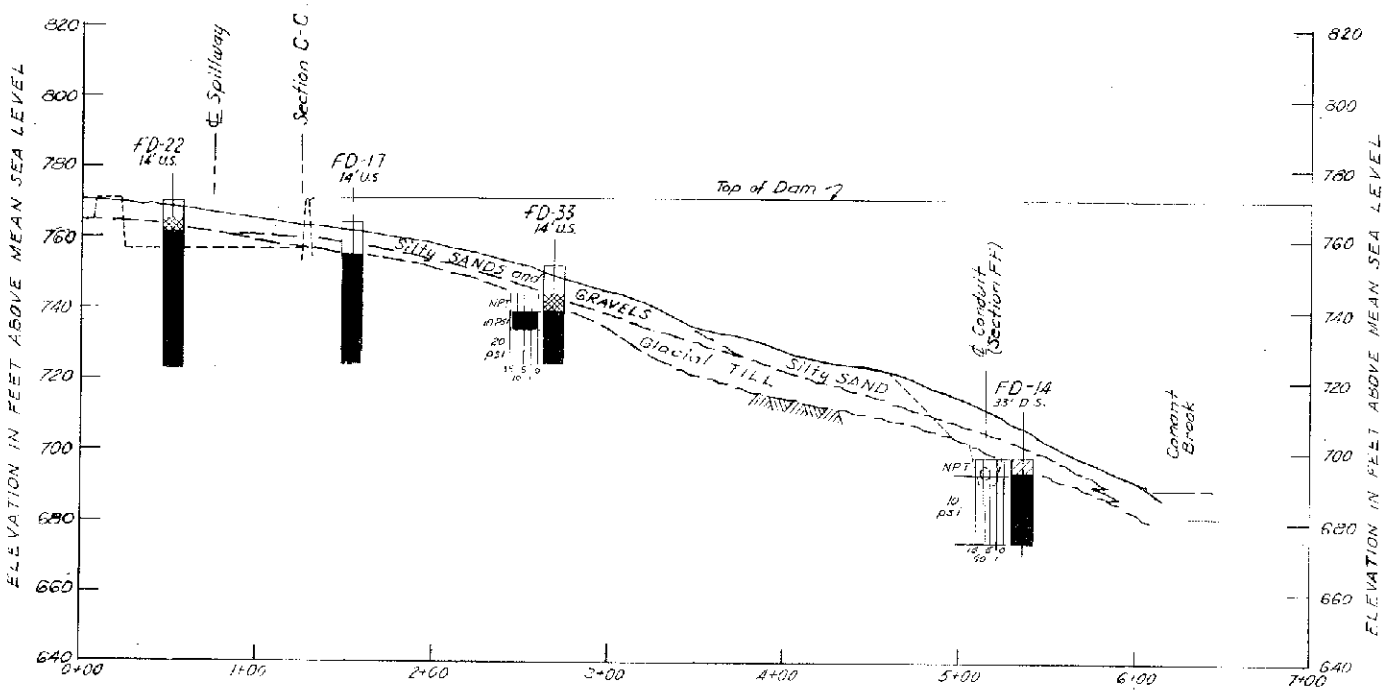
U. S. ARMY



SECTION A-A SURVEY BASELINE

(LOOKING UPSTREAM)

SCALES
HOR. 1" = 40'
VERT. 1" = 20'



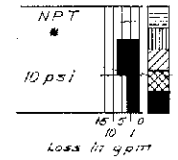
SECTION B-B RIGHT ABUTMENT - CENTERLINE OF DAM

(LOOKING UPSTREAM)

SCALES
HOR. 1" = 20'
VERT. 1" = 20'

LEGEND FOR CORE BORING IN ROCK

FD-1 Foundation Test Boring



- Rock core recovery 0-25%
- Rock core recovery 25-50%
- Rock core recovery 50-75%
- Rock core recovery 75-90%
- Rock core recovery 90-100%

NPT No Pressure Test Performed. Asterisk denotes that section could not be sealed for testing.

10 psi Constantly maintained pressure for 1 to 5 minutes. Volume loss in gallons per minute under constant pressure, tested continuously in 5 foot sections. Scale expanded from 0 gpm to 1 gpm for clarification of low flow losses.

Assumed Rock Surface

NOTES

The glacial till consists principally of gravelly silty sand containing numerous cobbles and occasional boulders. Included also are substantial sections of silty sand, thin layers of silt and clay and seams of relatively clean sand. The till grades with depth from brown, moderately compact to gray, very compact.

For Record of Foundation Explorations, see Sheet No.

For Location of Geologic-Log Sections, see Sheet No.

NOTE

This drawing is presented for general information and is to be considered only as a supplement to the records of explorations in other contract drawings. Geologic sections shown hereon are the Government interpretation of subsurface conditions believed to exist in and between borings. Variations between elevations, composition and structure of the individual formations as represented hereon and as actually encountered in the progress of the work are to be anticipated.

GRAPHIC SCALES

1" = 20' 20' 0 20' 40'

1" = 40' 40' 0 40' 80'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
C.A.M.	R.D.B.	R.C.G.

SUBMITTED: Chief, Geology Section
PROJECT ENGINEER
APPROVAL RECOMMENDED: Chief, Engineering Division
APPROVAL RECOMMENDED: Chief, Design Branch

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN

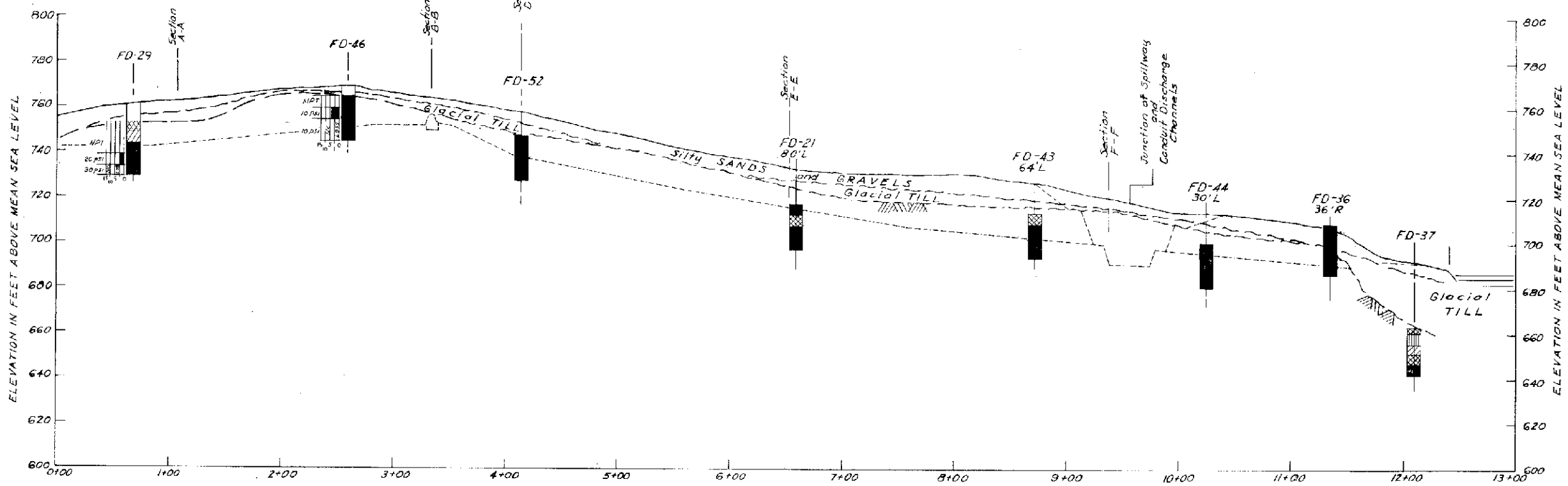
CONANT BROOK DAM
GEOLOGIC-LOG SECTIONS - DAM
CHICOPEE RIVER, MASSACHUSETTS

APPROVED: Chief, Engineering Division
DATE APRIL 1964

SCALE AS SHOWN SPEC. NO CIV. ENG. - 19-016-64-43
DRAWING NUMBER
CON-8
SHEET 18

CORPS OF ENGINEERS

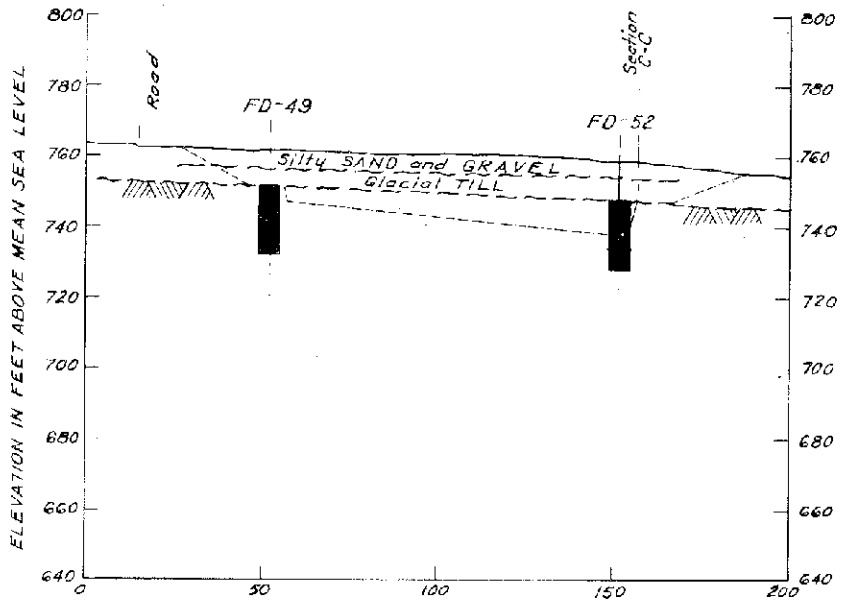
U. S. ARMY



SECTION C-C OUTBOARD SIDE OF SPILLWAY

(LOOKING TOWARD RIVER)

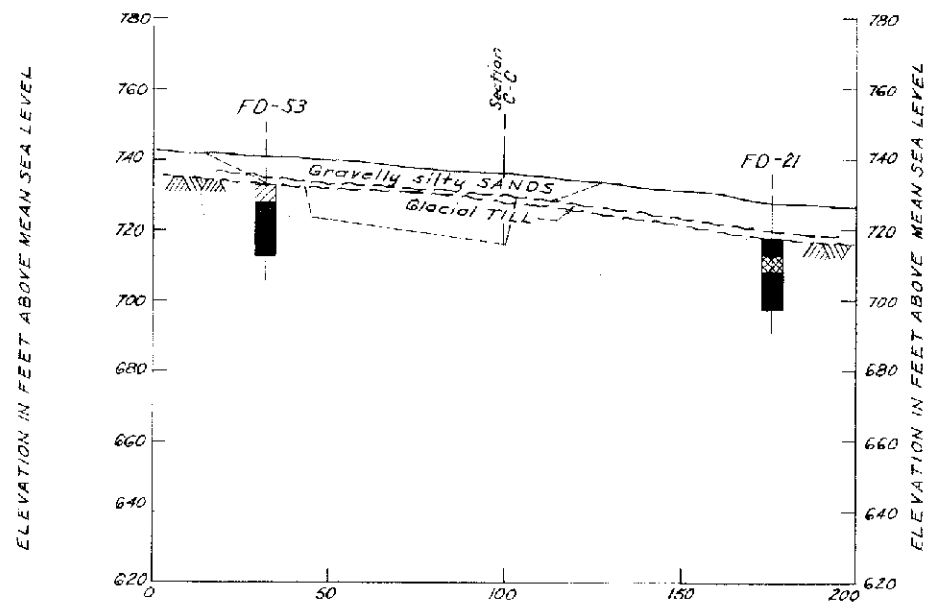
SCALES
HOR. 1" = 40'
VERT. 1" = 20'



SECTION D-D STA. 6+20 SPILLWAY ℄

(LOOKING UPSTREAM)

SCALES
HOR. 1" = 20'
VERT. 1" = 20'



SECTION E-E STA. 8+65 SPILLWAY ℄

(LOOKING UPSTREAM)

SCALES
HOR. 1" = 20'
VERT. 1" = 20'

GRAPHIC SCALES

1" = 20' 20' 0 20' 40'

1" = 40' 40' 0 40' 80'

NOTES

For Record of Foundation Explorations, see Sheet Nos.

For Location of Geologic-Log Sections, see Sheet No.

For Legend of Core Borings in Rock, and Notes applicable to Geologic Sections, see Sheet No.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY	DR. BY	CH. BY
C.A.M.	R.D.B.	R.C.G.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FDN. & MAT'LS. BRANCH
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN

CONANT BROOK DAM

GEOLOGIC - LOG SECTIONS - SPILLWAY

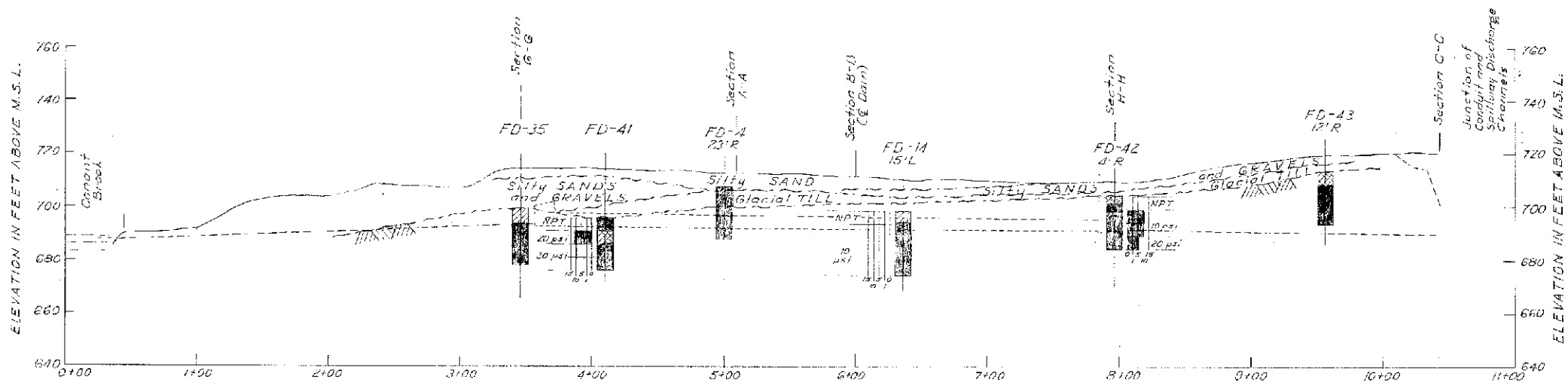
CHICOPEE RIVER MASSACHUSETTS

DATE APRIL 1964

SCALE AS SHOWN SPEC. NO CIV. ENG. - 19-016-64-43

DRAWING NUMBER
CON-8

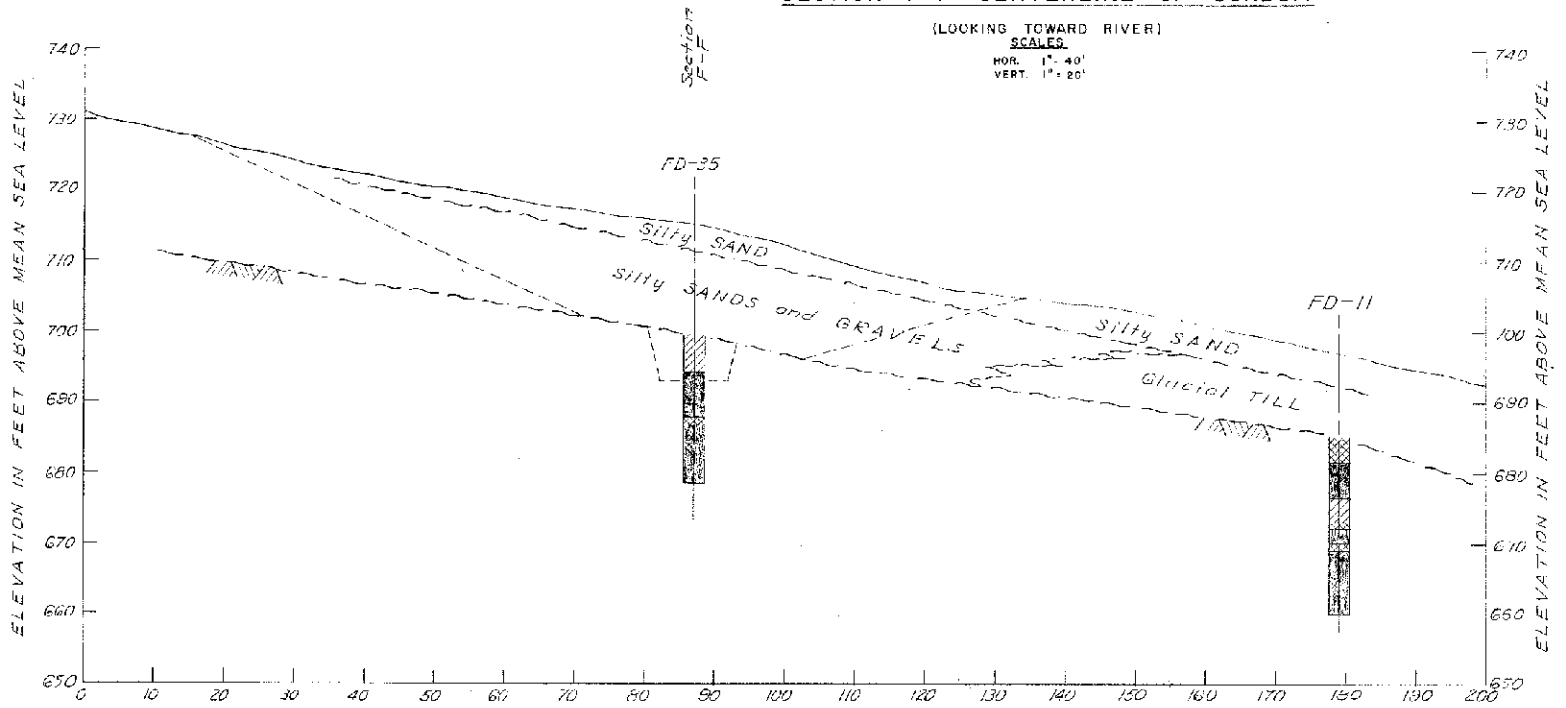
SHEET 19



SECTION F-F CENTERLINE OF CONDUIT

(LOOKING TOWARD RIVER)

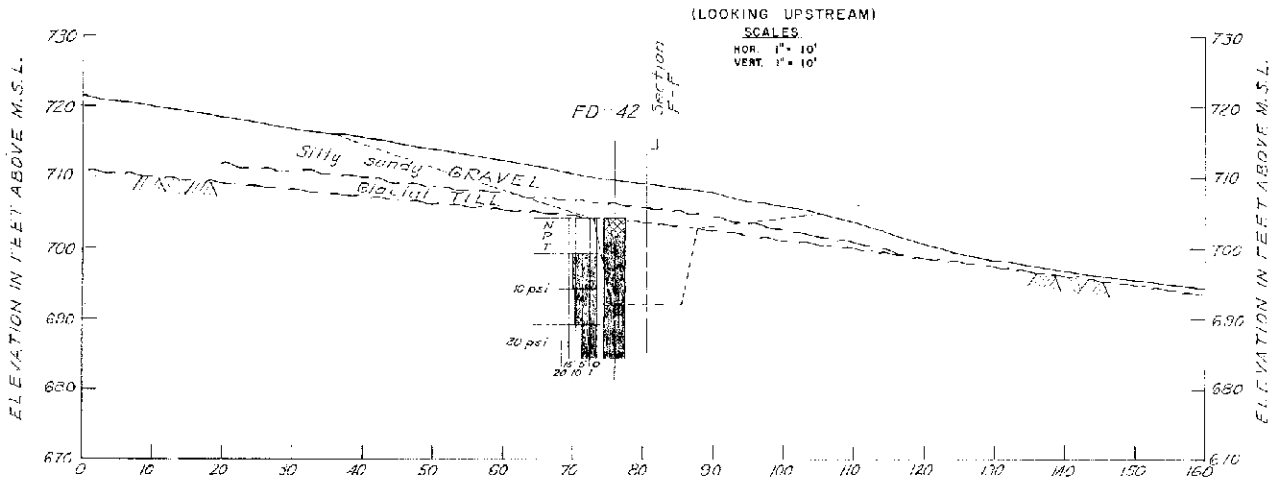
SCALES
HOR. 1" = 40'
VERT. 1" = 20'



SECTION G-G STA. 3+50 CONDUIT ℄

(LOOKING UPSTREAM)

SCALES
HOR. 1" = 10'
VERT. 1" = 10'



SECTION H-H STA. 8+00 CONDUIT ℄

(LOOKING UPSTREAM)

SCALES
HOR. 1" = 10'
VERT. 1" = 10'

NOTES

For Record of Foundation Explorations, see Sheet Nos.

For Location of Geologic Log Sections, see Sheet No.

For Legend of Core Borings in Rock and Notes applicable to Geologic Sections, see Sheet No.

GRAPHIC SCALES

1" = 10' 10' 0 10' 20'

1" = 20' 20' 0 20' 40'

1" = 40' 40' 0 40' 80'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY	DR. BY	CK. BY
C.A.M.	R.D.B.	R.C.G.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN

CONANT BROOK DAM

GEOLOGIC - LOG SECTIONS - CONDUIT

CHICOPEE RIVER, MASSACHUSETTS

DATE APRIL 1964

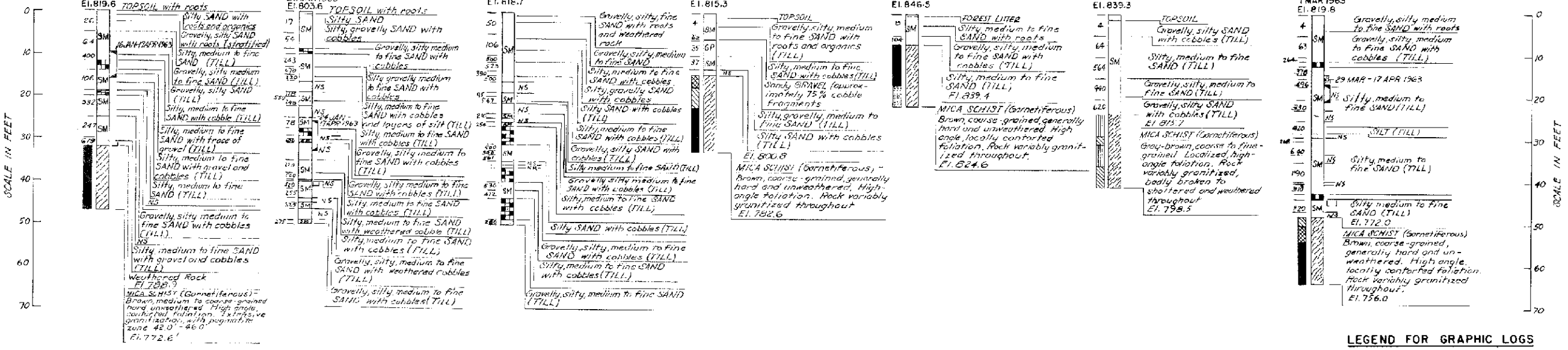
SCALE AS SHOWN SPEC. NO CIV ENG - 19 - 016 - 64 - 42

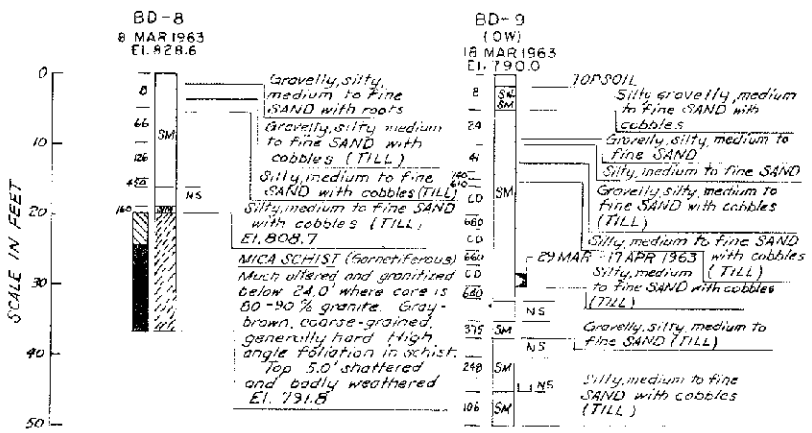
DRAWING NUMBER
CON - 8

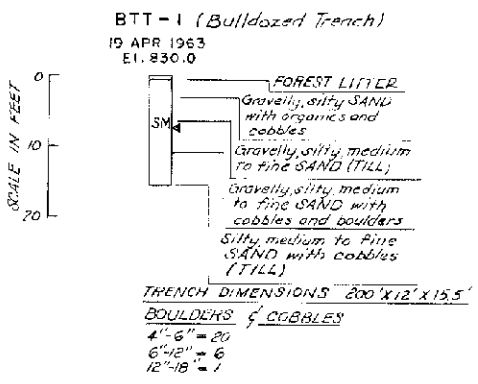
SHEET 20

CORPS OF ENGINEERS

U. S. ARMY







LEGEND FOR GRAPHIC LOGS

BD-1 — Borrow Test Boring
(OW) — Observation well installed
3 MAY 1963 — Date exploration completed
El. 642.1 — Elevation of ground surface during time of exploration
Maximum artesian head
Subsurface water level in boring at time of exploration
Range of subsurface water during period of observation
Artesian flow encountered
SP — Group letter symbol according to Unified Soil Classification System
NR — No recovery or unsatisfactory soils samples recovered
NS — Not sampled. Hole advanced by Core-drilling, blasting and/or wash boring due to operational difficulty
Bottom of observation well
CD — Sampling in overburden by Core drill method
Blows per foot of penetration considered most representative for each sample drive using a 350 pound hammer with a free fall of about 18" on a standard 5 foot, solid sample spoon with a beveled, sharpened drive shoe.
Blow count not recorded or not considered representative.
Cobble or boulder (Core-drilled)
Cobbles or boulders, continuous or nested (Core-drilled and/or blasted and chopped)
El. 614.1 — Elevation of bedrock surface
Rock symbol
Rock Core Recovery 0 - 25 %
Rock Core Recovery 25 - 50 %
Rock Core Recovery 50 - 75 %
Rock Core Recovery 75 - 90 %
Rock Core Recovery 90 - 100 %
El. 610.1 — Elevation, bottom of exploration

NOTES

Elevations refer to Mean Sea Level Datum.

For Location of Borrow Explorations see Sheet No.

GRAPHIC SCALE
1" = 10'
10' 0 10' 20'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
C.A.M.	L.H.T.	R.C.G.

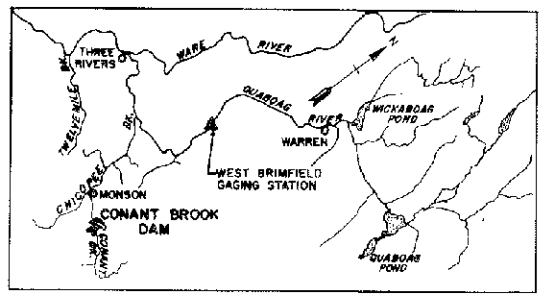
SUBMITTED: H.C. Starkey, HEAD, GEOLOGY SECTION
PROJECT ENGINEER: A.C. Martin
APPROVAL RECOMMENDED: C. Potts, CHIEF, FOUNDATIONS BRANCH
APPROVAL RECOMMENDED: Wm. A. Wright, CHIEF, DESIGN BRANCH
APPROVED: C.W. Sherman, CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN
CONANT BROOK DAM
RECORD OF BORROW EXPLORATIONS
CHICOPEE RIVER MASSACHUSETTS

DATE: APRIL 1964
SCALE 1" = 10'
SPEC. NO CIV. ENG. - 19 - 016 - 64 - 43
DRAWING NUMBER
CON - 8
SHEET 25

CORPS OF ENGINEERS

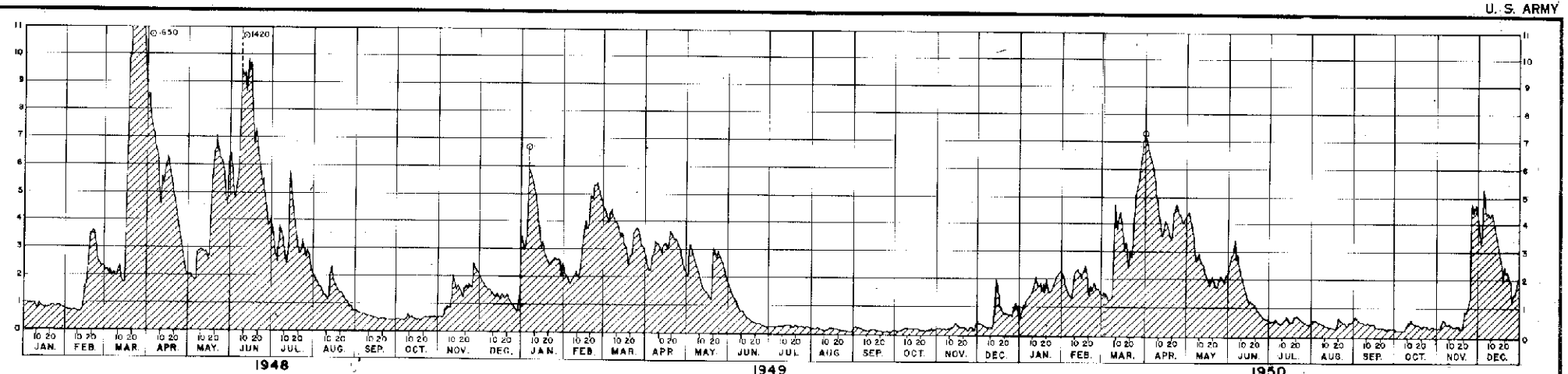
U. S. ARMY

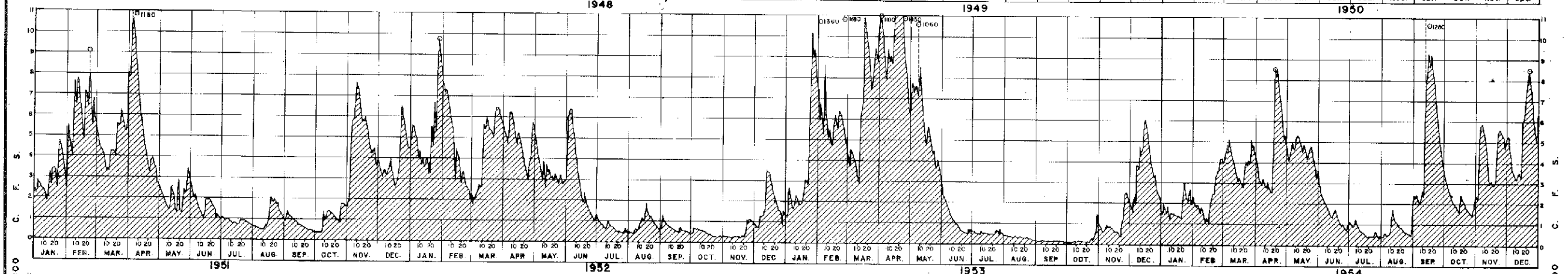


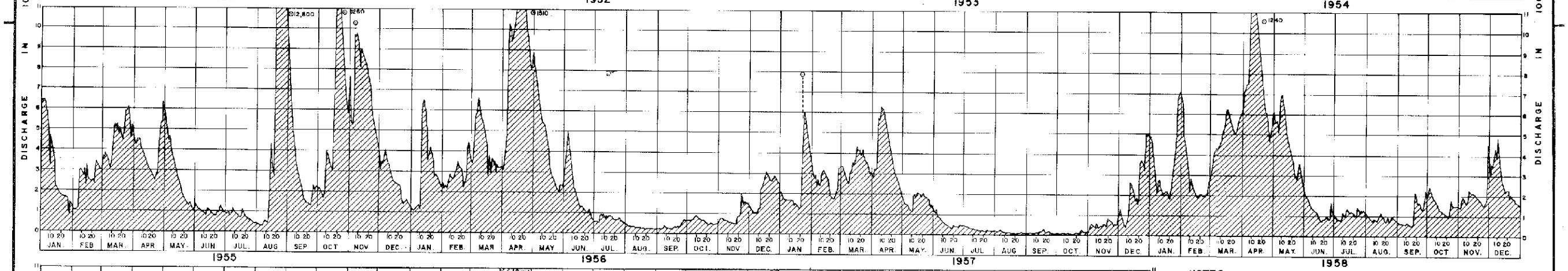
LOCATION MAP

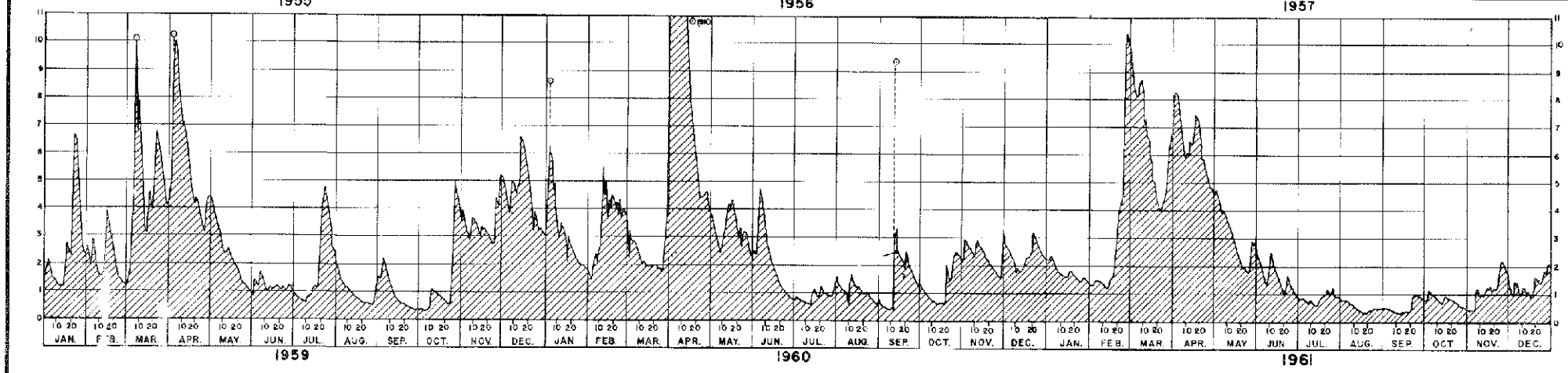
0 1 2 3

SCALE IN MILES









NOTES

1) THESE HYDROGRAPHS ARE THE DAILY AVERAGE STREAM FLOW RECORD OF THE QUABOAG RIVER AT WEST BRIMFIELD, MASSACHUSETTS, FROM A DRAINAGE AREA OF 151 SQ. MILES.
2) INSTANTANEOUS PEAK DISCHARGES WHERE AVAILABLE ARE SHOWN BY ⊙
3) ADDITIONAL DAILY AVERAGE FLOWS FROM 1912 TO 1947 ARE AVAILABLE AT THE CORPS OF ENGINEERS OR WITH THE UNITED STATES GEOLOGICAL SURVEY.
4) DURING PERIODS OF FLOODING, THE PEAK FLOWS ON QUABOAG RIVER ARE GREATLY REDUCED BY THE LARGE AMOUNT OF VALLEY STORAGE IN THE LAKES AND MARSHY AREAS UPSTREAM OF WARREN AND THEREFORE A COMPARISON OF PEAK FLOWS ON A STRAIGHT DRAINAGE AREA BASIS SHOULD NOT BE ATTEMPTED.
5) THERE ARE NO DISCHARGE RECORDS FOR CONANT BROOK; THE DRAINAGE AREA AT THE DAMSITE IS 2.8 SQ. MI.
6) SEASONAL VARIATIONS IN FLOW ON CONANT BROOK GENERALLY FOLLOW THE FLOW PATTERN ON THE QUABOAG RIVER.
7) THE COMPUTED PEAK FLOW OF 9500 C.F.S. AT THE DAMSITE DURING THE RECORD FLOOD OF AUGUST 1955 IS ESTIMATED TO HAVE A FREQUENCY OF OCCURRENCE IN EXCESS OF 100 YEARS.
8) THE DATA CONTAINED HEREON ARE NOT INTENDED AS REPRESENTATIONS OR WARRANTIES BUT ARE FURNISHED FOR INFORMATION ONLY. IT IS EXPRESSLY UNDERSTOOD THAT THE GOVERNMENT WILL NOT BE RESPONSIBLE FOR ANY DEDUCTION, INTERPRETATION OR CONCLUSION THEREFROM MADE BY ANY BIDDER OR CONTRACTOR.

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
R.P.M.	J.D.	F.C.

CONNECTICUT RIVER FLOOD CONTROL

CONANT BROOK DAM

HYDROGRAPHS

QUABOAG RIVER MASSACHUSETTS

F. F. Chilson
CHIEF, HYD. & INSPECTION

REVIEWED:

PROJECT ENGINEER

APPROVED
CHIEF, DESIGN BRANCH

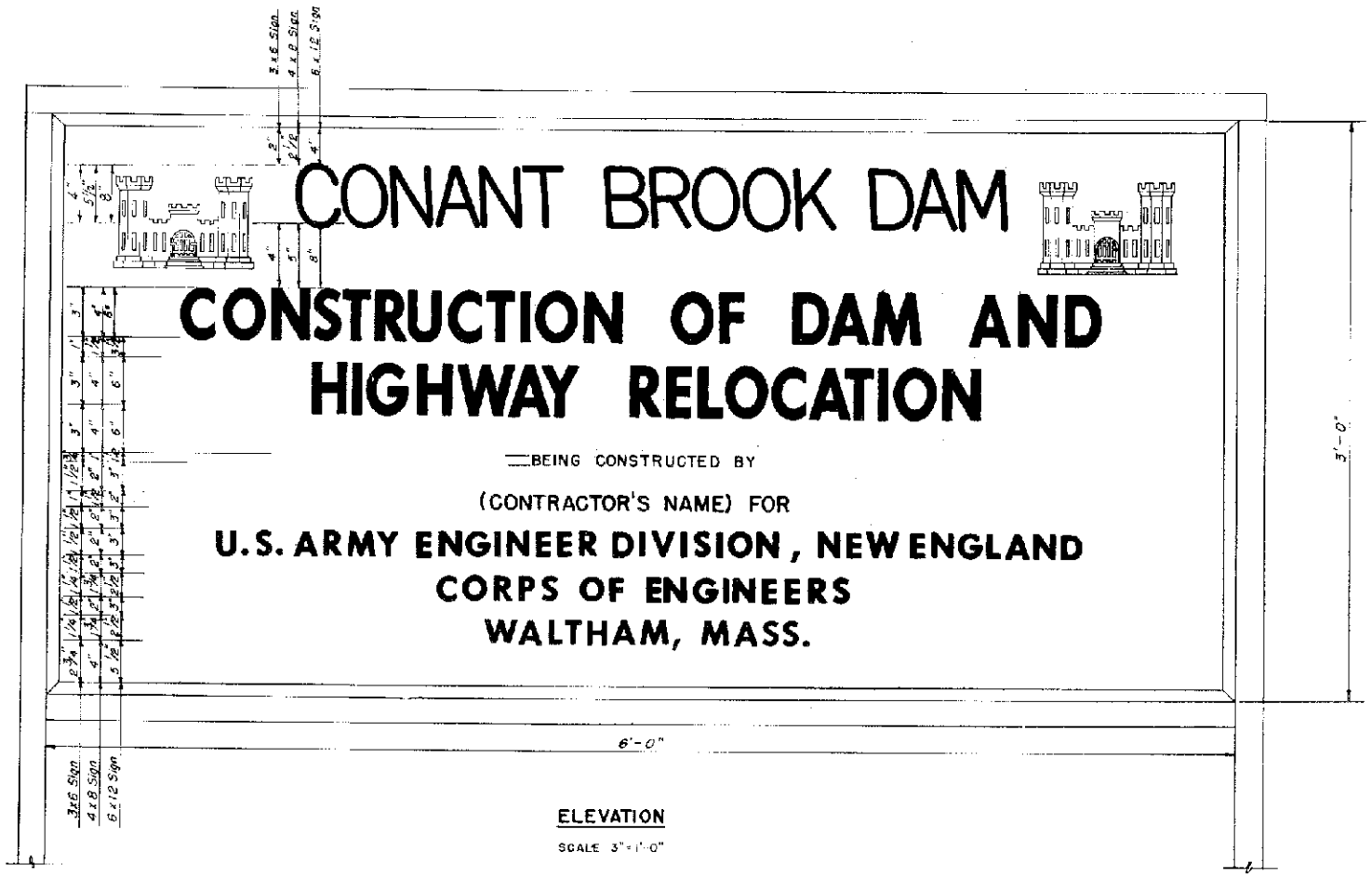
APPROVED
CHIEF, ENGINEERING DIVISION

DATE APRIL 1964

SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-018-64-43

DRAWING NUMBER

SHEET 27



CONANT BROOK DAM

CONSTRUCTION OF DAM AND HIGHWAY RELOCATION

BEING CONSTRUCTED BY

(CONTRACTOR'S NAME) FOR

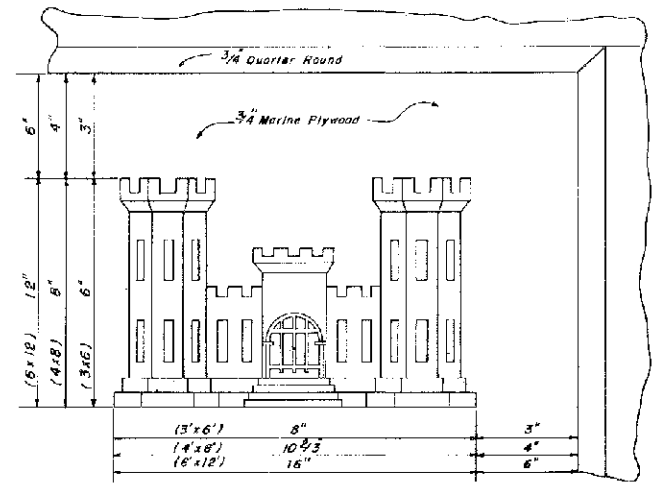
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

ELEVATION

SCALE 3"=1'-0"

NOTE:

This elevation is of a 3' x 6' sign. See specifications for size required under this contract

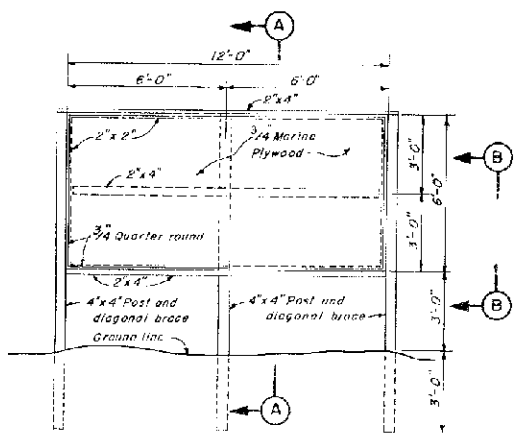


DETAIL OF CASTLE

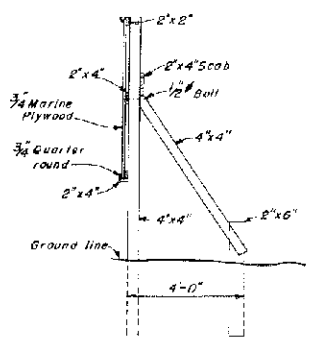
SCALE 6"=1'-0"

SPECIFICATIONS

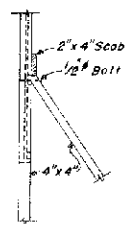
1. Posts, rails and bracing shall be No.1 yellow pine or approved equal S4S-Fed. Spec. MM-L-751c.
2. All exposed surfaces shall be given one coat of linseed oil and wiped prior to primer coat.
3. All exposed surfaces shall be given one coat of exterior lead and oil primer-Fed. Spec. TT-P-25a and two finish coats of white exterior oil paint-Fed. Spec. TT-P-104.
4. Black lettering and red Engineer Castles shall be Kem Bulletin Colors C20 B1 and C20 R1 respectively as manufactured by Sherwin-Williams Co. or approved equal
5. Marine Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.



ELEVATION

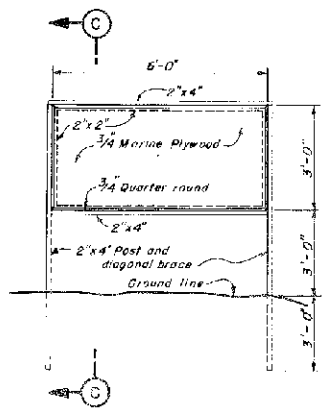


SECTION A-A

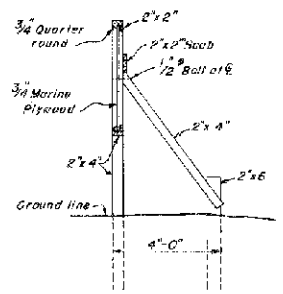


SECTION B-B

6' x 12' SIGN



ELEVATION



SECTION C-C

3'x6' SIGN
AND
4' x 8' SIGN

CONSTRUCTION SIGNS

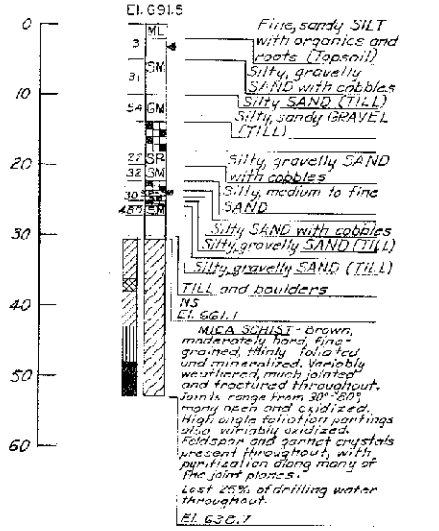
SCALE 3/8"=1'-0"

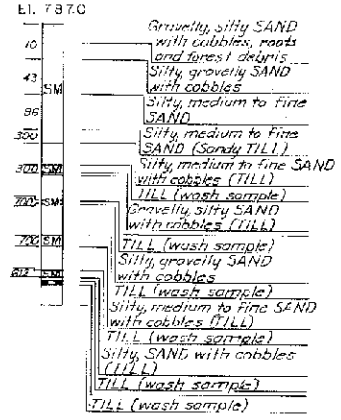
CONSTRUCTION SIGN

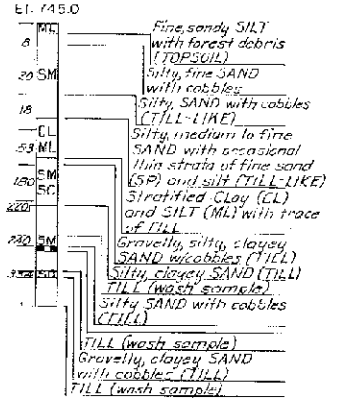
DRAWING NUMBER
CON - 8
SHEET NUMBER
2 / A

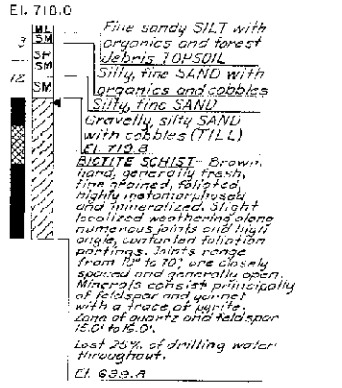
CORPS OF ENGINEERS

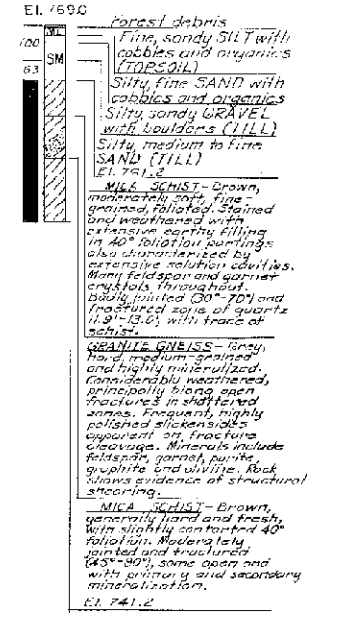
U. S. ARMY.

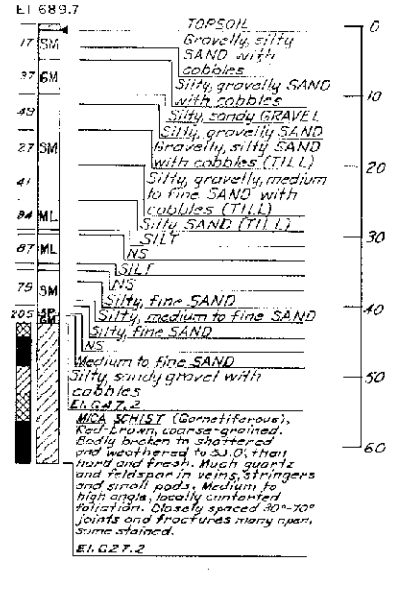








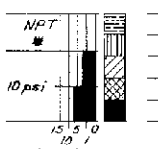




LEGEND FOR GRAPHIC LOGS

FD-1 Foundation Test Boring
FT-1 Foundation Test Pit
FTT-1 Foundation Test Trench
(GW) Observation Well Installed
17 AUG. 1962 Date exploration completed
El. 689.7 Elevation of ground surface during time of exploration

Maximum artesian head
Subsurface water level in boring at time of exploration.
Range of subsurface water during period of observation.
Artesian flow encountered
SM Group letter symbol according to Unified Soil Classification System.
NR No Recovery or unsatisfactory soil samples recovered.
NS Not Sampled. Hole advanced by Core-drilling, blasting and/or wash boring due to operational difficulty.
Bottom of observation well.
CD Sampling in overburden by core-drilled method.
Blows per foot of penetration considered most representative for each sample drive using a 300 to 350 pound hammer with a free fall of about 18" on 1⅜" I.D. or 2" O.D., 2" I.D. or 2½" O.D. and/or 2½" I.D. or 3" O.D. size sample spoon equipped with a beveled and sharpened drive shoe.
Blow counts not recorded or not considered representative
Cobble or boulder (Core-drilled)
Cobbles or boulders, continuous or nested (Core-drilled and/or blasted and chopped)
El. 475.7 Elevation of bedrock surface
Rock symbol
El. 455.7 Elevation bottom of exploration

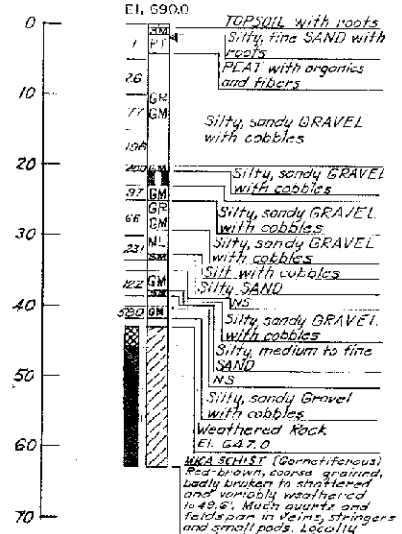


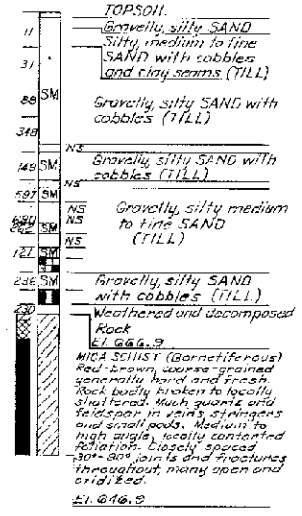
Rock core recovery 0 - 25%
Rock core recovery 25 - 50%
Rock core recovery 50 - 75%
Rock core recovery 75 - 90%
Rock core recovery 90 - 100%

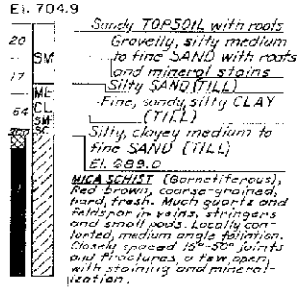
NPT No Pressure Test Performed. Asterisk denotes that section could not be sealed for testing.
10 psi Constantly maintained pressure for 1 to 5 minutes
Volume loss in gallons per minute under constant pressure, tested continuously in 5 foot sections.
Scale expanded from 0gpm to 1gpm for clarification of low flow losses.

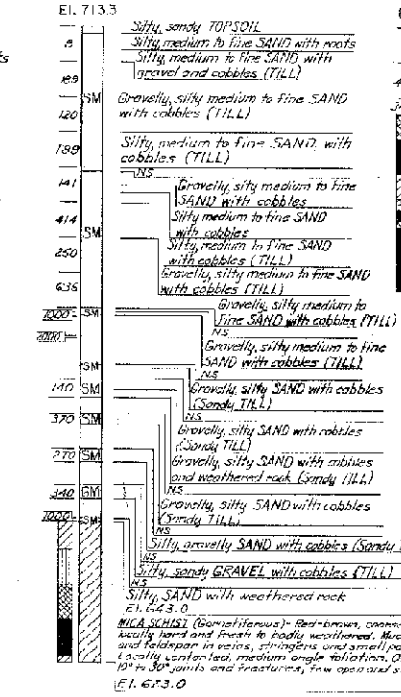
Water levels recorded during subsurface explorations seldom correspond with the natural level of free ground water, except in extensive and thick deposits of sands and gravels which are sufficiently pervious to permit rapid stabilization of water levels in the exploratory hole. Absence of subsurface water level in the graphic log of any exploration is not necessarily to be construed that ground water will not be encountered in excavation at that location.

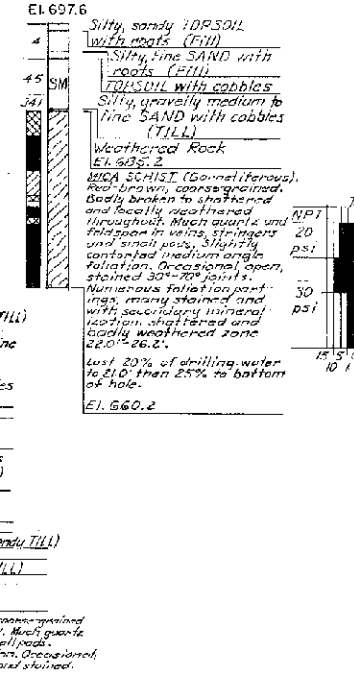
While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the overburden and rocks of this region are anticipated, and if encountered such variations will not be considered as differing "Materially" from represented conditions within the purview of Article 4 of the Contract.

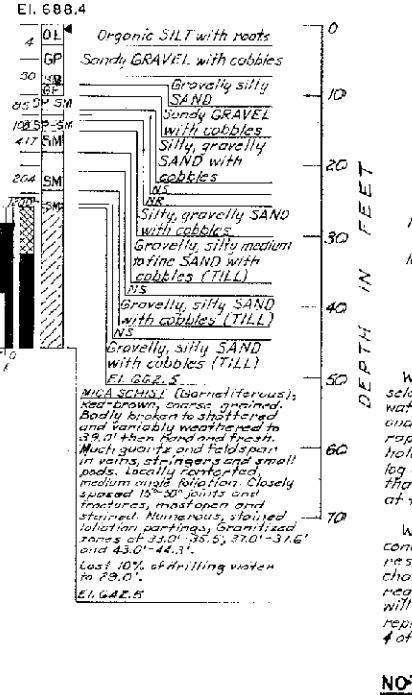


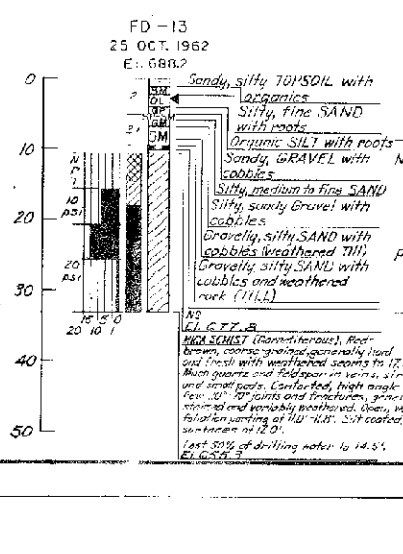


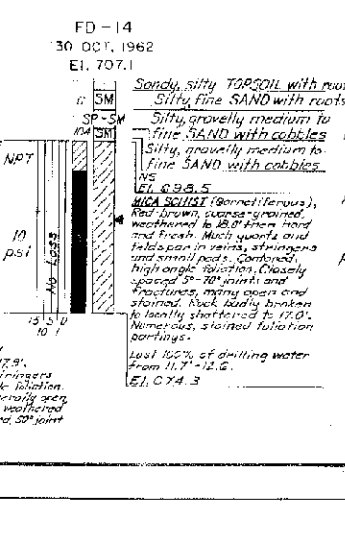


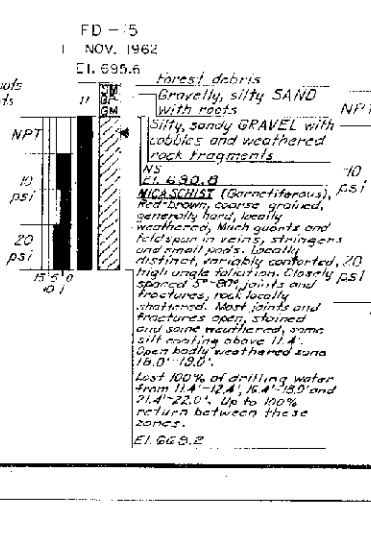


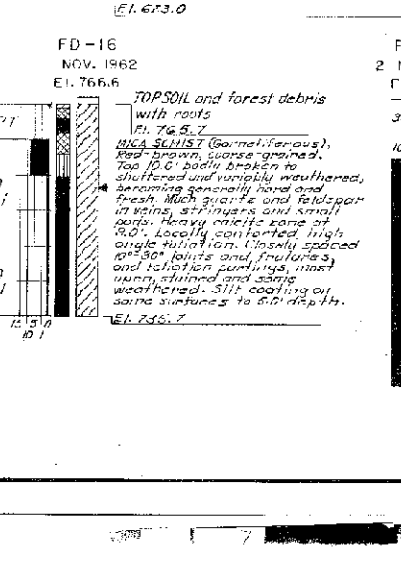


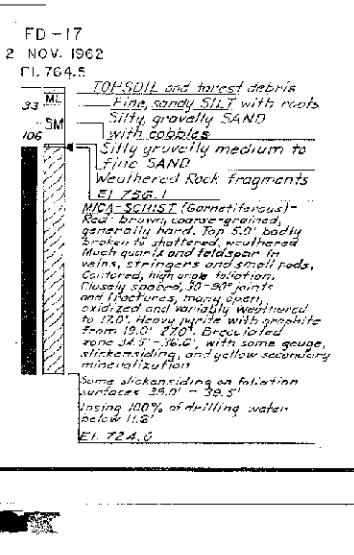












GRAPHIC SCALE
1" = 10' 0' 10' 20'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY C. A. M.	DR. BY R. D. B.	CK. BY R. C. G.
SUBMITTED: Chief, Geology Section		
PROJECT ENGINEER: Chief, Foundation & Materials Branch		
APPROVAL RECOMMENDED: Chief, Design Branch		

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN
CONANT BROOK DAM
RECORD OF FOUNDATION EXPLORATIONS
NO. 1
CHICOPEE RIVER MASSACHUSETTS

APPROVED: Chief, Engineering Division
DATE APRIL 1964

SCALE 1" = 10' (SPEC. NO CIV. ENG. - 19 - 016 - 64 - 43)
DRAWING NUMBER
CON - 8
SHEET #1

CORPS OF ENGINEERS

U. S. ARMY

DEPTH IN FEET

FD-8
6 NOV. 1962
El. 746.3

Silty, sandy TOPSOIL with forest debris
Gravelly silty medium to fine SAND with roots and cobbles
Silty, gravelly SAND with cobbles
Silty medium to fine SAND with cobbles
Gravelly, sandy SILT with cobble fragments
El. 740.9
MICA SCHIST (Garnetiferous)- Red-brown, coarse grained, generally hard and fresh. Much quartz and feldspar in veins, stringers and small pods. Contorted, high angle foliation. Closely spaced, generally open, 15°-70° joints and fractures, some with oxidation and slight weathering above 719'. Losing 100% of drilling water below 8.1'.
El. 702.5

FD-9
9 NOV. 1962
El. 695.2

Silty, sandy TOPSOIL with forest debris
Silty, medium to fine SAND with gravel and cobbles
Silty, gravelly SAND with cobbles
Gravelly, silty SAND with cobbles (TILL)
Silty, gravelly medium to fine SAND with cobbles
Silty, gravelly medium to fine SAND with cobbles
Silty, sandy GRAVEL with cobbles
Gravelly, silty medium to fine SAND
Silty, gravelly SAND with cobbles
Gravelly, silty medium to fine SAND with cobbles (TILL)
Weathered Rock
El. 660.5
MICA SCHIST (Garnetiferous)- Red-brown, coarse-grained, variably soft and locally badly weathered to 674.0', then hard and fresh. Some quartz and feldspar in veins, stringers and small pods. Contorted, high angle foliation. Closely spaced, open, 15°-70° joints and low angle fractures, many oxidized to 638.0'. Core badly broken to shattered above 659.0'.
El. 620.6

FD-20
7 NOV. 1962
El. 725.1

TOPSOIL with roots
Silty medium to fine SAND with roots
Silty, sandy GRAVEL
Cobble fragments with Silty fine SAND
Silty, gravelly SAND
El. 712.8
MICA SCHIST (Garnetiferous)- Red-brown, generally hard and fresh, coarse grained. Contorted high angle foliation. Much quartz and feldspar in veins, stringers and small pods. Near vertical, slightly contorted foliation. Closely spaced 30°-70° joints and fractures, many open and oxidized above 680.0'. Silt coating on foliation joint and fracture surfaces at 15.5' and 17.7'. Rock generally much altered throughout.
El. 691.7

FD-21
13 NOV. 1962
El. 727.6

TOPSOIL and forest debris
Gravelly, silty medium to fine SAND with roots
Silty, gravelly SAND with cobbles
Silty, gravelly SAND
Gravelly, silty SAND
El. 712.6
MICA SCHIST (Garnetiferous) Red-brown, coarse grained generally hard and fresh. Much quartz and feldspar in veins, stringers and small pods. Near vertical, slightly contorted foliation. Closely spaced 30°-70° joints and fractures, many open and stained, some are weathered. Numerous, open fracture partings with slickensides at 10.0' and 21.5'. Yellow, waxy, secondary mineralization on slick surfaces.
El. 697.6

FD-22
16 NOV. 1962
El. 770.2

TOPSOIL and forest debris
Silty, sandy GRAVEL with cobbles
El. 765.3
MICA SCHIST (Garnetiferous) Red-brown, generally hard, locally weathered above 16.5'. Coarse grained. Much quartz and feldspar in veins, stringers and small pods. Contorted, high angle foliation. Closely spaced, 30°-70° joints and fracturing and numerous foliation partings mineralized, many open, weathered and variably weathered above 16.5'. Mineral coating including pyrite on many surfaces below 16.5'.
El. 724.6

FD-23
25 NOV. 1962
El. 695.2

Silty, sandy TOPSOIL with roots
Gravelly, silty fine SAND with roots
Gravelly, silty SAND with cobbles and rust stains (Wisconsin TILL)
Silty SAND with cobbles (TILL) slightly plastic
Gravelly, silty medium to fine SAND with cobbles (TILL)
Silty, gravelly, medium to fine SAND with cobbles (TILL)
CLAY and SILT stratified
Silty, gravelly SAND
Gravelly, silty fine SAND with cobbles and stratified layers of silt (TILL)
Sandy CLAY with cobbles (TILL)
Gravelly, silty clayey SAND
Gravelly, silty SAND with cobbles (TILL)
Fine sandy SILT
Gravelly, medium to fine sandy SILT
Fine sandy SILT
Fine, sandy SILT with stratified layers of silt and fine sand
Silty, fine SAND with stratified layers of SILT
Silty medium to fine SAND with rust stains and stratified layers of SILT
Silty, sandy GRAVEL with cobbles
El. 645.5
MICA SCHIST (Garnetiferous)- Red-Brown, slightly to badly weathered to 66.0' then hard and fresh, coarse grained. Much quartz and feldspar in veins, stringers and small pods. Contorted, high angle foliation. Closely spaced, 30°-70° joints. Mineralized out, many open and variably weathered. 52.9'-66.0' Badly broken to shattered, weathered mineralized, some slickensides at 60.0'-60.9' (brecciated zone).
El. 622.2

FD-24
20 NOV. 1962
El. 764.4

TOPSOIL and forest debris
Sandy GRAVEL with cobbles
Silty Sandy GRAVEL
El. 751.6
MICA SCHIST (Garnetiferous)- Red-brown, generally hard, to slightly weathered locally coarse-grained. Much quartz and feldspar in veins, stringers and small pods. Contorted, medium to high angle foliation. Closely spaced, open 30°-70° joints and fractures, many surfaces chalked, coated and variably weathered, occasional pyritization. Vertical joint persists throughout much of core.
El. 726.3

FD-25
21 NOV. 1962
El. 764.2

TOPSOIL and forest debris
Gravelly silty SAND with roots
Silty, gravelly SAND
Silty SAND with ¼" layer of silt (ML)
Fine, sandy SILT stratified with mineral stain
Silty, SAND with silt layers
Gravelly, silty, medium to fine SAND
El. 753.6
MICA SCHIST (Garnetiferous)- Red brown, generally hard, locally weathered to 6.5', coarse grained. Much quartz and feldspar in veins, stringers and small pods. Contorted, medium to high angle foliation. Closely spaced 15°-70° joints and fractures to 20.0', most open and oxidized, some with pyrite. Lousy mineral filling at foliation starting at 24.0'. Open, oxidized, vertical joint 19.5'-20.5'.
El. 730.1

FD-26
27 NOV. 1962
El. 759.9

TOPSOIL and forest debris
Gravelly silty SAND with roots
Silty, gravelly SAND
Gravelly, fine sandy SILT
Medium to fine SAND
Silty, gravelly SAND with cobbles
Gravelly, silty SAND
Silty, gravelly SAND with cobbles
Silty, medium to fine SAND with cobbles
Weathered and decomposed Rock
El. 736.9
MICA SCHIST (Garnetiferous)- Red-brown, generally hard and fresh, coarse-grained. Top 1.5' slightly weathered. Much quartz and feldspar in veins, stringers and small pods. Contorted, medium to high angle foliation. Occasional open, 10°-70° joints, few stained and coated.
El. 716.9

FD-27
(DW)
4 DEC. 962
El. 720.6

Silty, sandy TOPSOIL with forest debris and roots
Silty SAND with cobbles
Silty medium to fine SAND with cobbles and rust stains (TILL)
Gravelly, silty medium to fine SAND with cobbles
Silty SAND with cobbles (TILL)
Gravelly, sandy, silty CLAY with cobbles and stratified layers of clayey silt 10'-15' (TILL)
Gravelly, silty, clayey SAND (TILL)
Variably graded, gravelly silty SAND with cobbles and occasional thin strata of clayey SAND (SC) (TILL)

FD-28
29 NOV. 1962
El. 760.3

TOPSOIL and forest debris with roots
Silty, gravelly SAND with cobbles
Silty fine SAND
Gravelly SAND with cobbles
Silty, sandy GRAVEL
El. 709.3
MICA SCHIST (Garnetiferous)- Red-brown, coarse grained, locally badly weathered throughout. Much quartz and feldspar in veins, stringers and small pods. Contorted, medium to high angle foliation. Foliation zone 15.0'-15.6'. Rock highly jointed and fractured throughout. Joints range from 30°-90°, most open, stained, rooted and weathered. 23.3'-23.5' filtered zone. Green clay with slickensides at foliation surfaces with graphite and pyrite.
El. 725.1

FD-29
3 DEC. 1962
El. 761.4

TOPSOIL and forest Debris with roots
Silty, sandy SILT with roots
Silty, sandy GRAVEL
Gravelly, sandy SILT stratified
El. 753.4
MICA SCHIST (Garnetiferous)- Red-brown, generally hard and fresh, coarse grained. Much quartz and feldspar in veins, stringers and small pods. Closely jointed and fractured throughout, top 13.0' variably shattered, joints range from 0°-70°, many open, stained and coated. Open badly oxidized and coated 70° joint at 31.7'. Losing 5% of drilling water throughout.
El. 729.2

FD-30
4 DEC. 1962
El. 763.5

TOPSOIL and forest debris with roots
Silty, gravelly SAND with roots and cobbles
Silty, sandy GRAVEL with cobbles
Silty, gravelly SAND with cobbles
El. 759.2
MICA SCHIST (Garnetiferous) Red-brown, coarse grained, generally hard and fresh. Much quartz and feldspar in veins, stringers and small pods, locally contorted high angle foliation. 30°-70° joints and fractures, many surface chalked, coated and variably weathered, occasional pyritization. Vertical joint persists throughout much of core.
El. 730.7

NOTES

Elevations refer to Mean Sea Level Datum.

For Location of Foundation Explorations, see Sheet No.

For Legend of Graphic Logs and Notes Applicable to Subsurface Explorations, see Sheet No.

GRAPHIC SCALE
1" = 10'
10' 0 10' 20'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY	DR. BY	CK. BY
C.A.M.	R.D.B.	R.C.G.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FOUNDATIONS BRANCH
APPROVAL RECOMMENDED
CHIEF DESIGN BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN
CONANT BROOK DAM
RECORD OF FOUNDATION EXPLORATIONS NO. 2
CHICOPEE RIVER MASSACHUSETTS

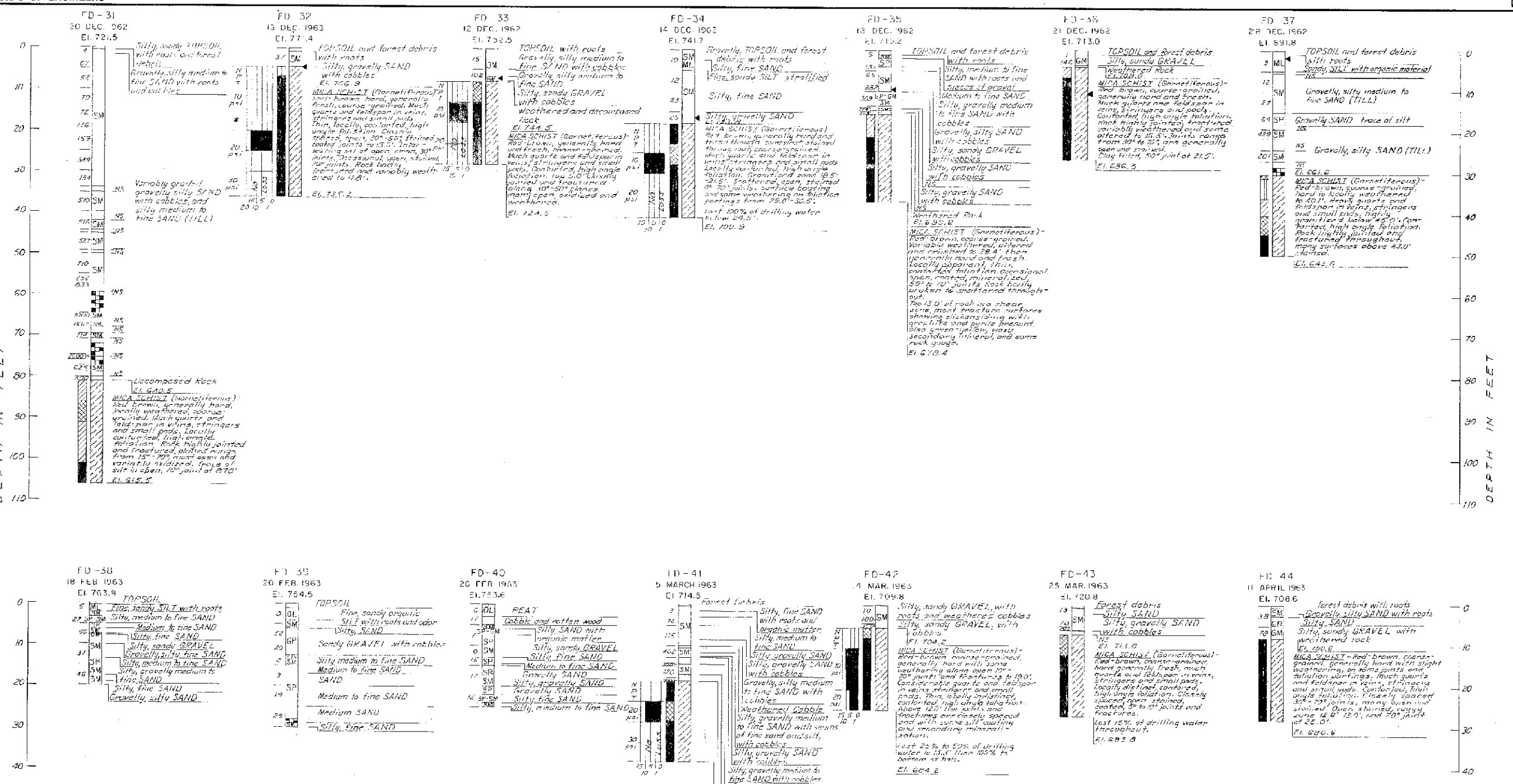
DATE APRIL 1964

SCALE 1" = 10' SPEC NO CIV. ENG. - 19 - 016 - 64 - 43
DRAWING NUMBER
CON-8

SHEET 22

CORPS OF ENGINEERS

U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum.

For Location of Foundation Explorations FD-38, FD-39 and FD-40, see Sheet No. All others shown on Sheet No.

For Legend of Graphic Logs and Notes applicable to Subsurface Explorations, see Sheet No.

GRAPHIC SCALE
1" = 10'
10' 0 10' 20'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY C. A. M.	DR. BY R. D. B.	CK. BY R. C. G.

SUBMITTED: H. A. Conley, HEAD, GEOLOGY SECTION
PROJECT ENGINEER: [illegible]
APPROVAL RECOMMENDED: [illegible], CHIEF, FOR & MAT'LS BRANCH
APPROVAL RECOMMENDED: [illegible], CHIEF, DESIGN BRANCH
APPROVED: [illegible], CHIEF, ENGINEERING DIVISION
DATE: APRIL 1964

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN
CONANT BROOK DAM
RECORD OF FOUNDATION EXPLORATIONS NO. 3
CHICOPEE RIVER, MASSACHUSETTS

SCALE 1" = 10' | SPEC. NO CIV. ENG. - 19 - 016 - 64 - 42
DRAWING NUMBER
CON - 8
SHEET 23

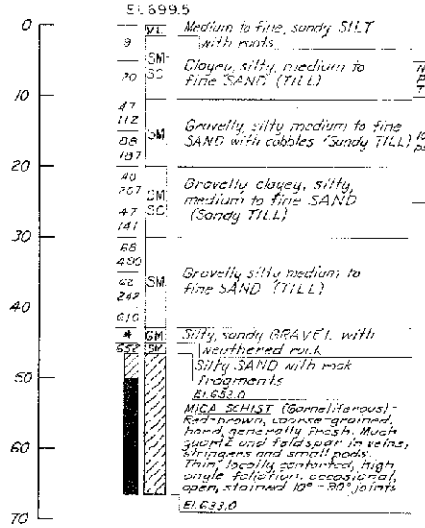
CORPS OF ENGINEERS

U. S. ARMY

FD-45

22 MAR 1963

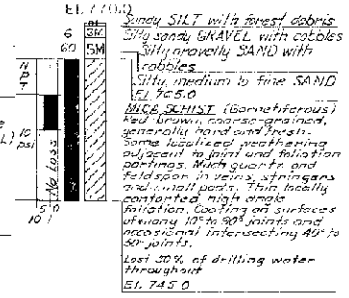
El. 699.5



FD-46

28 MAR 1963

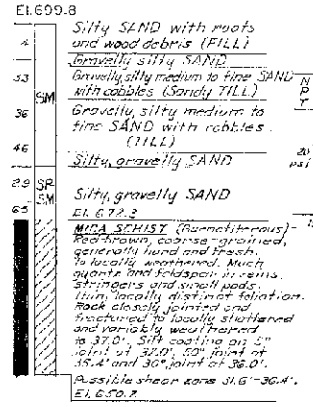
El. 710.0



FD-47

2 APRIL 1963

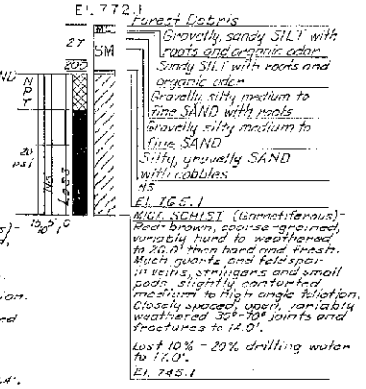
El. 699.8



FD-48

2 APRIL 1963

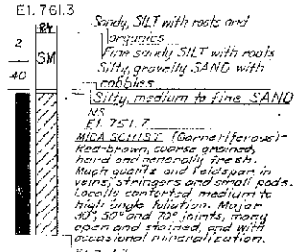
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FD-49

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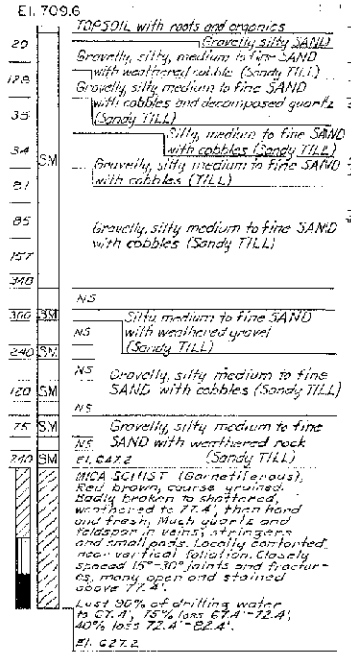
El. 761.3



FD-50

12 APRIL 1963

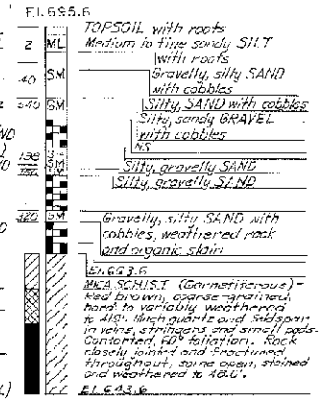
El. 709.6



FD-51

4 APRIL 1963

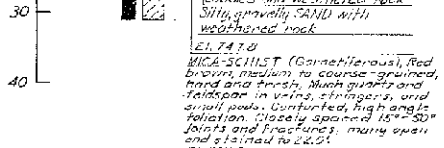
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FD-52

9 APRIL 1963

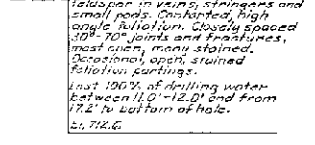
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FD-53

15 APRIL 1963

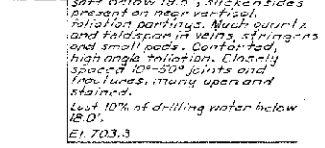
El. 740.8



FD-54

7 APRIL 1963

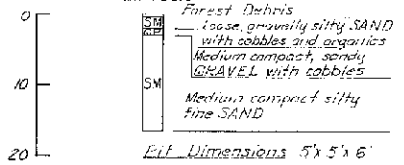
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FT-1

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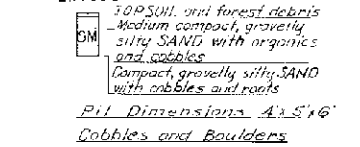
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15 SEPT 1958

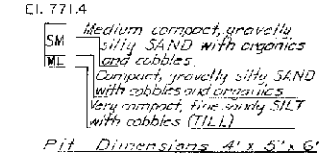
El. 766.3



F-3

15 SEPT. 1958

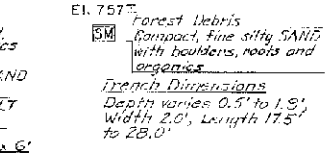
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FTT-1

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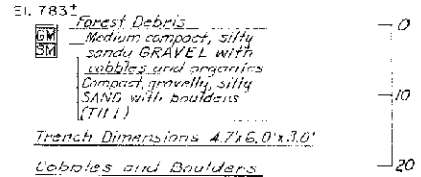
El. 757±



FTT-2

26 SEPT. 1963

El. 783±



NOTES

Elevations refer to Mean Sea Level Datum.

For Location of Foundation Explorations see Sheet No.

For Legend of Graphic Logs and Notes applicable to Subsurface Explorations, see Sheet No.

GRAPHIC SCALE

10' 0 10' 20'

1" = 10'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.A.M. | DR. BY R.D.B. | CH. BY R.C.G.

SUBMITTED

HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED

CHIEF, FOUNDATIONS BRANCH

APPROVAL RECOMMENDED

CHIEF, DESIGN BRANCH

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN

CONANT BROOK DAM
RECORD OF FOUNDATION EXPLORATIONS NO. 4
CHICOPEE RIVER MASSACHUSETTS

APPROVED

CHIEF, ENGINEERING DIVISION

DATE APRIL 1964

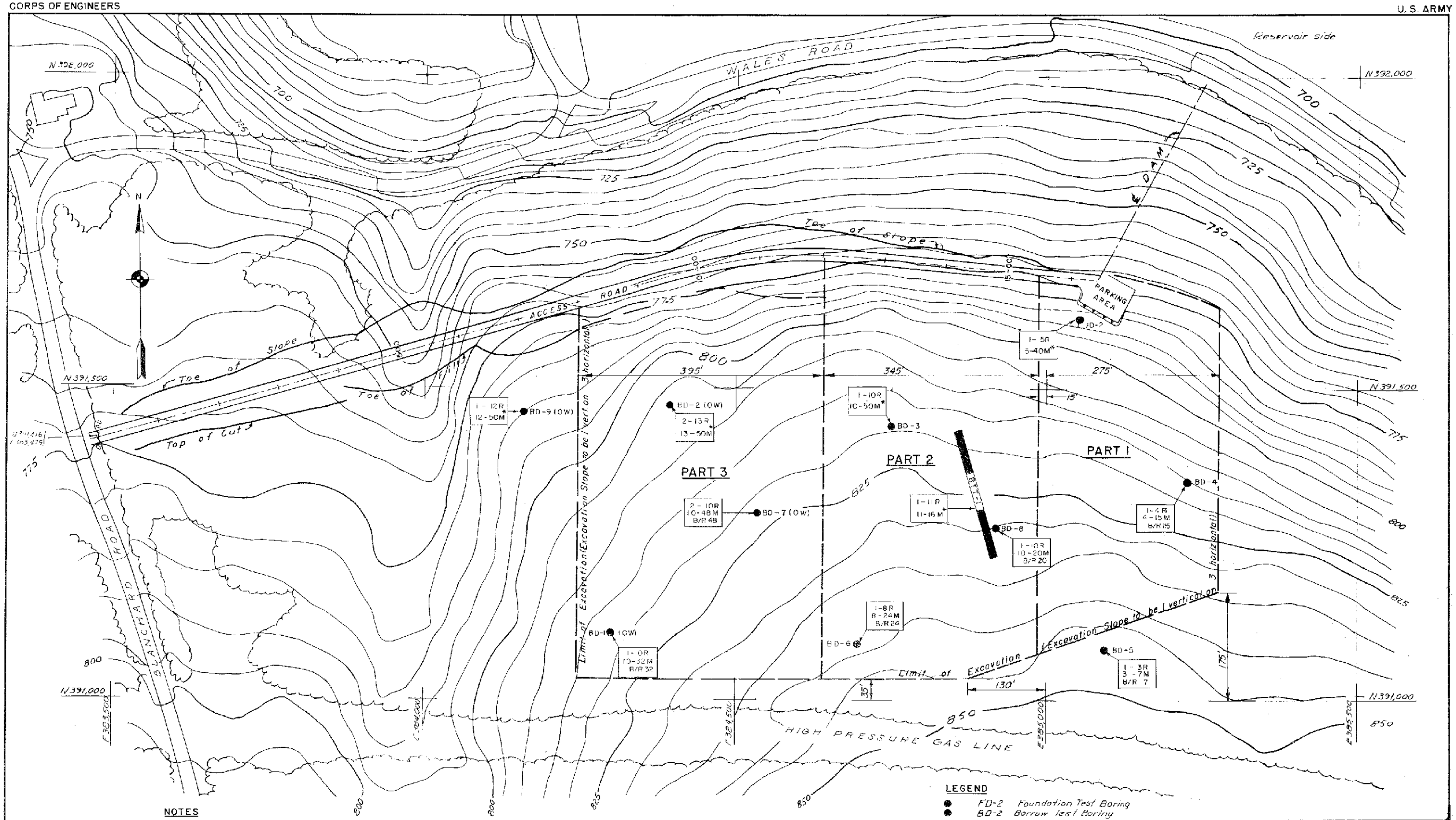
SCALE 1" = 10' | SPEC. NO. CIV. ENG. - 19 - 016 - 64 - 63

DRAWING NUMBER
CON-8

SHEET 24

CORPS OF ENGINEERS

U.S. ARMY



NOTES

1. Figures in rectangles represent approximate depth range for random fill material (R) and impervious fill material (M) in explorations.
2. B/R Approximate depth to bedrock in feet
3. * indicates bedrock not encountered
4. For location of Borrow Area, see Sheet
5. Elevations refer to Mean Sea Level Datum
6. Contour interval is 5 feet
7. Plane coordinates refer to Massachusetts Lambert Grid System.

LEGEND

- FD-2 Foundation Test Boring
- BD-2 Borrow Test Boring
- BTT-1 Borrow Test Trench, Power Excavated
- (OW) Observation Well Installed

PLAN

SCALE: 1" = 60'

GRAPHIC SCALE

60' 0 60' 120'

1" = 60'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY	DR. BY	CK. BY
W.C.H.	R.D.B.	R.C.G.

SUBMITTED: W. C. Healey, CHIEF GEOLOGY SECTION
PROJECT ENGINEER: J. J. Martini
APPROVAL RECOMMENDED: CHIEF, FOUNDATIONS & MATERIALS BRANCH
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH

CONNECTICUT RIVER FLOOD CONTROL
CHICOPEE RIVER BASIN
CONANT BROOK DAM
PLAN OF BORROW EXPLORATIONS
CHICOPEE RIVER MASSACHUSETTS

APPROVED: CHIEF, ENGINEERING DIVISION
DATE: APRIL 1964

SCALE 1" = 60' | SPEC. NO CIV. ENG. - 19-018-64-43

DRAWING NUMBER
CON-8

SHEET 25



1964 Reports

Highway relocation & appurtenant structures.

City/Town	Monson
Dam	Conant Brook Dam
Name	Massachusetts Comm
Name	U S Army Engineers
Streets	Wales Road
Water	Chicopee River
Water	Conant Brook

CONNECTICUT RIVER FLOOD CONTROL PROJECT

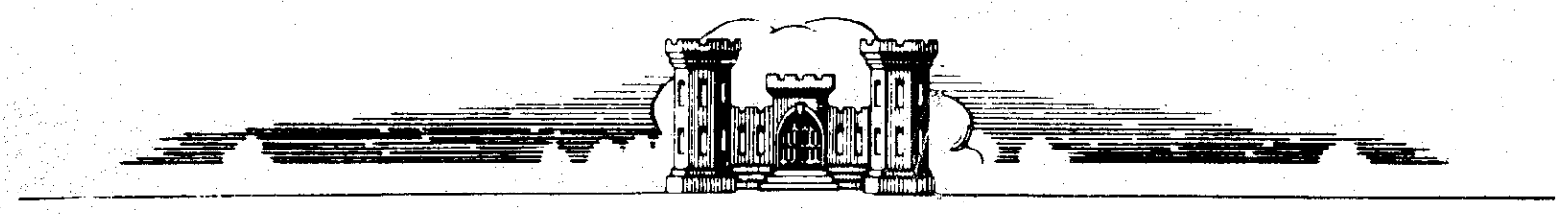
CONANT BROOK DAM

CHICOPEE RIVER, MASSACHUSETTS

PLANS FOR THE

CONSTRUCTION OF HIGHWAY RELOCATION AND APPURTENANT STRUCTURES

VOLUME II



approved
5-13-64

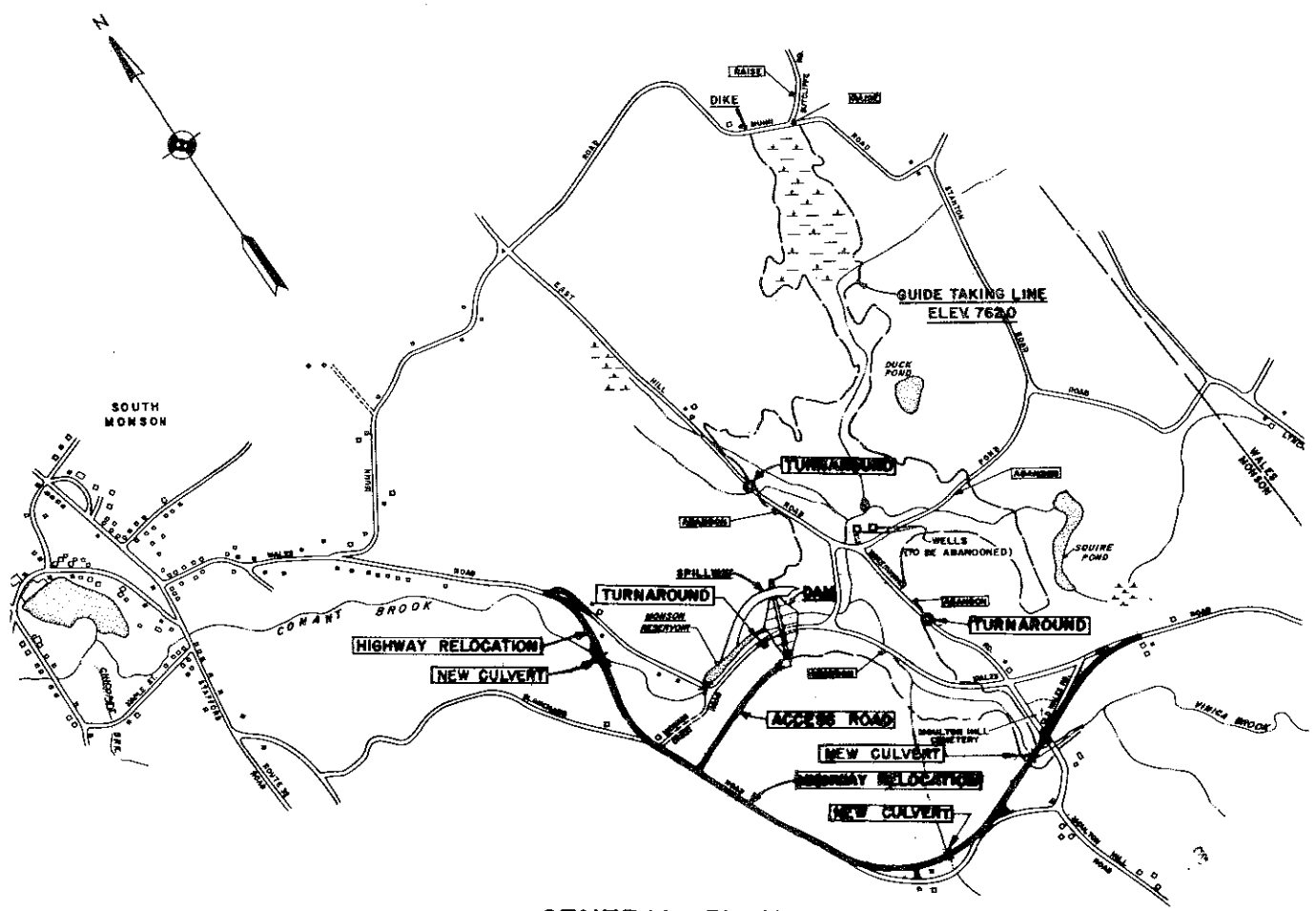
U.S. Army Engineer Division, New England
Corps of Engineers Waltham, Mass.

APRIL 1964

All drawings in this folio have beem reduced

CORPS OF ENGINEERS

U. S. ARMY

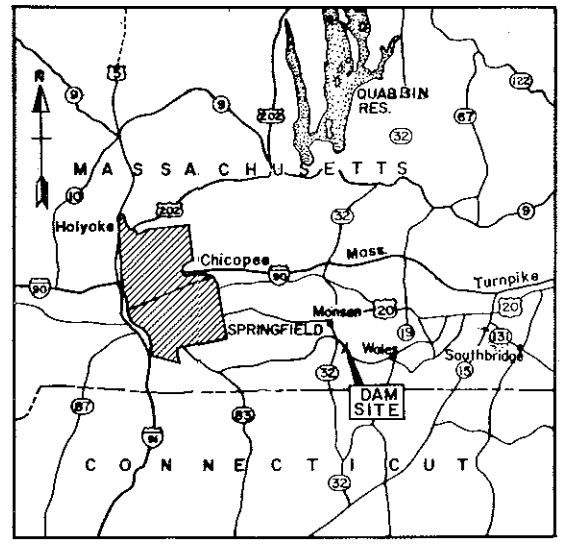


GENERAL PLAN

SCALE: 1" = 1000'

INDEX TO DRAWINGS VOL. II

DRAWING NO.	SHEET NO.	TITLE
CON-9	1	HIGHWAY RELOCATIONS AND ACCESS ROAD GENERAL PLAN AND INDEX
"	2	WALES ROAD - PLAN AND PROFILE NO. 1
"	3	" " - " " NO. 2
"	4	" " - " " NO. 3
"	5	" " - " " NO. 4
"	6	" " - " " NO. 5
"	7	" " - " " NO. 6
"	8	" " - " " NO. 7
"	9-46	" " - CROSS SECTIONS
"	47	" " - CULVERT CROSSING - CONANT BROOK - PLAN AND SECTIONS
"	48	WALES ROAD - CULVERT CROSSING - VINICA BROOK - PLAN AND SECTIONS
"	49	WALES ROAD - CULVERT CROSSINGS - CONANT AND VINICA BROOK - PROFILES
"	50	WALES ROAD - TURNOFF - PLAN
"	51	" " - TURNOFF - CROSS SECTIONS
"	52	ACCESS ROAD - PLAN AND PROFILE NO. 1
"	53	" " - " " NO. 2 - TURNAROUNDS AND SECTIONS (WATERWORKS AND EAST HILL ROADS)
"	54-59	ACCESS ROAD - CROSS SECTIONS
"	60	TYPICAL ROAD SECTIONS
"	61	FOUNDATION EXPLORATIONS NO. 1
"	62	" " NO. 2
		VOLUME I **CONANT BROOK DAM**
CON-8	INDEX ON SHEET 1	RESERVOIR MAP AND INDEX



LOCATION MAP

SCALE: 1" = 7 MILES

GENERAL NOTES

1. Elevations refer to Mean Sea Level Datum.
2. Clear only as required for construction.
3. For details of wells to be abandoned, see specifications.
4. Stripping is required only, in fill areas, where the finish road grades are 3 feet or less above existing ground surface and as shown on sections.
5. Coordinate system based on Mass. Rectangular coordinate system.
6. All graded areas shall have 4" Seeded Topsoil unless otherwise shown or specified.

LEGEND

NEW	EXISTING	DESCRIPTION
—672—	---672---	Contours
x672.2	x672.2	Elevations
		Tree Line
		Trees
		Roads or drives
		Curbing
	-x-EF-x-	Fence
—GR—	—EGR—	Guard railing
		Buildings
		Seeded topsoil ditch
		Rock slope protection
		Stone wall
— C —	— C —	Culvert
		Boulder and ledge outcrop
		Bit. conc. paved ditch
		Jute matted ditch
		Rock slope protection apron
	— W —	Water Line
● FD		Foundation Test Boring
■ FT		" " Pit
▬ FTT		" " Trench
● FP		" " Probing
● FA	O	" Hand Auger Boring Pole

BENCH MARKS

DESIGNATION	DESCRIPTION	ELEVATION
T.B.M. "A"	Top Concrete Post (Marked 10C) East of Existing Road 50' South P.I. No. 1.	673.07
T.B.M. "B"	Top Boulder 40' Right Sta. 20+0	737.19
T.B.M. "C"	P.K. Nail in root of 6" Pine 28' left Sta. 34+25	813.49
T.B.M. "D"	P.K. Nail in root of 12" Oak 29' Left Sta. 51+25	861.43
T.B.M. "E"	P.K. Nail in South Side of Pole (CME Co. 35 NET) 38' Right Sta. 66+15	807.50
T.B.M. "F"	P.K. Nail in root on East Side of 20" Maple 60' left Sta. 77+0	776.63
T.B.M. "G"	Chiselled ▽ on northeast abutment of Vinica Brook Culv. under Moulton Hill Rd.	775.42
T.B.M. "H"	Large Boulder on East Side of Wales Road 75' North of P.I. No. 7	814.07

GRAPHIC SCALES

1" = 7 MI. 7MI. 0 7MI. 14MI

1" = 1000' 1000' 0 1000' 2000'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.McL.	D.L.W.	W.E.

SUBMITTED: Frederick C. Mencke, Jr. CHIEF, UTILITIES SECTION

REVIEWED: G. A. Hopkins HIGHWAY LOCATION SECT.

REVIEWED: [illegible]

APPROVED: [illegible] CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
GENERAL PLAN AND INDEX
CHICOPEE RIVER MASSACHUSETTS

APPROVED: [illegible] CHIEF, ENGINEERING DIVISION

DATE: APRIL 1964

SCALE AS SHOWN

SPEC. NO. CIV. ENG. 19-018-64-43

DRAWING NUMBER
CON - 9

SHEET 1

N394,000 N393,750 N393,500 N393,250 N393,000 N392,750

Wales Road

P.I. #1 (P.K. Nail)
N393,780.35
E383,631.23

S 32° 54'-40" E
400.84'

44°-31'-00"

6'x10' Rock slope protection apron
Inv. 650.5

12" C.I.

Top of cut

Pole #28

Bit. conc. berm

For continuation of turn-off see Sheet 50

E383,500

Howard L. Hatch

Toe of slope

Woods

Bit. conc. berm

Highway R.O.W. Line

Inv. 654.4

15" ACCMP

Swamp

Top of cut

34" Hemlock

Paper & Mail boxes

Water gate
¾" Copper

Ho

Water service line to be lowered to a minimum depth of 4.5' below finished grade. See specifications for extent of work & materials supplied by the Monson Water Dept.

Curve Data
Δ = 44°-31'-00"
T = 327.42'
R = 800'
L = 621.57'

Howard L. Hatch

P.T. Sta. 6+94.99

Woods

Dwight W. Poulin

S 11°-36'-20" W
1724.53'

Highway R.O.W. Line

℄ 15' Dia. Multi Plate Pipe
For finish grading and location see Sheet 47.

Conant Brook

Catherine W. Bruce

Woods

FD-55

FD-56

FD-57

Numerous Boulders

Toe of slope

Catherine W. Bruce

Woods

Swamp

Sta. 15+00
Match Line Sheet 3

Pole #27

Wales Road

12" Maple

Ho

6" Hemlock

12" Oak

J.B. Robertson

Sta. 0+00 (Wales Rd.)

Start of Road Relocation

Sta. 9+08.07
Turn-off

3-10" Oaks

P.C. Sta. 0+73.42

Transition

E383,250

PLAN
SCALE: 1" = 50'

PROFILE

Start of road relocation

-0.42%

Finish grade

15" ACCMP

Existing ground surface

15' Dia. Multi Plate Pipe

400' V.C.

Pl. Sta. 12+0
El. 666.5

680 670 660 650 640 630 620 610

0+0 1+0 2+0 3+0 4+0 5+0 6+0 7+0 8+0 9+0 10+0 11+0 12+0 13+0 14+0 15+0

PROFILE
SCALE: HORZ. 1" = 50'
VERT. 1" = 10'

GRAPHIC SCALES
1" = 10'
1" = 50'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H. Mc L. | DR. BY D. L. W. | CK. BY

SUBMITTED: CHIEF, UTILITIES SECTION

REVIEWED: HIGHWAY LOCATION ENGR.

REVIEWED: PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE APRIL 1964

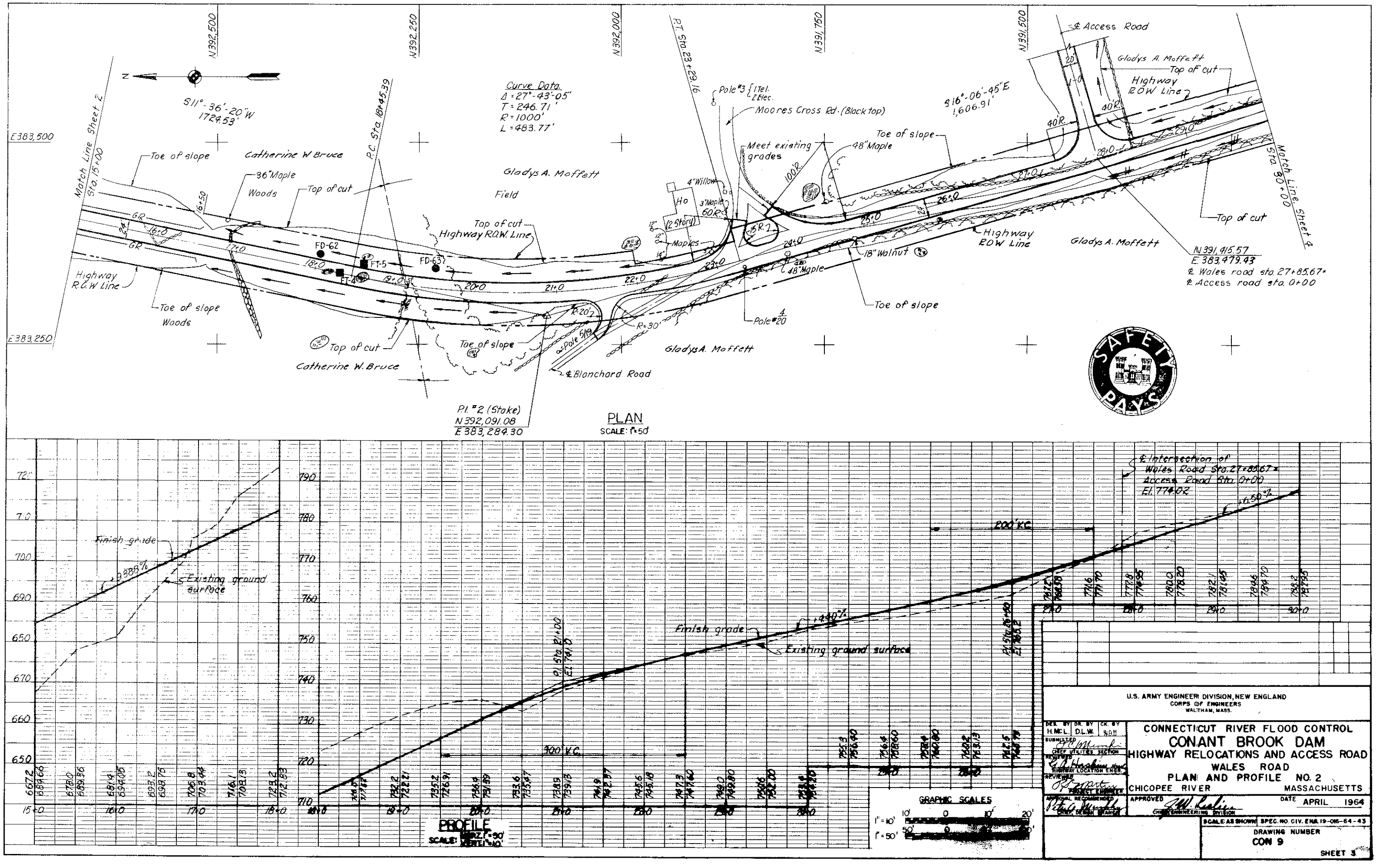
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
PLAN AND PROFILE NO. 1
CHICOPEE RIVER MASSACHUSETTS

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43

DRAWING NUMBER
CON - 9

SHEET 2

PLATE 1 - PLAN-PROFILE



U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.MCL. | DR. BY D.L.W. | CK. BY WM

SUBMITTED: Chief, Utilities Section

RECOMMENDED: Highway Location Engr.

REVIEWED: Chief, Design Branch

APPROVED: Chief, Engineering Division

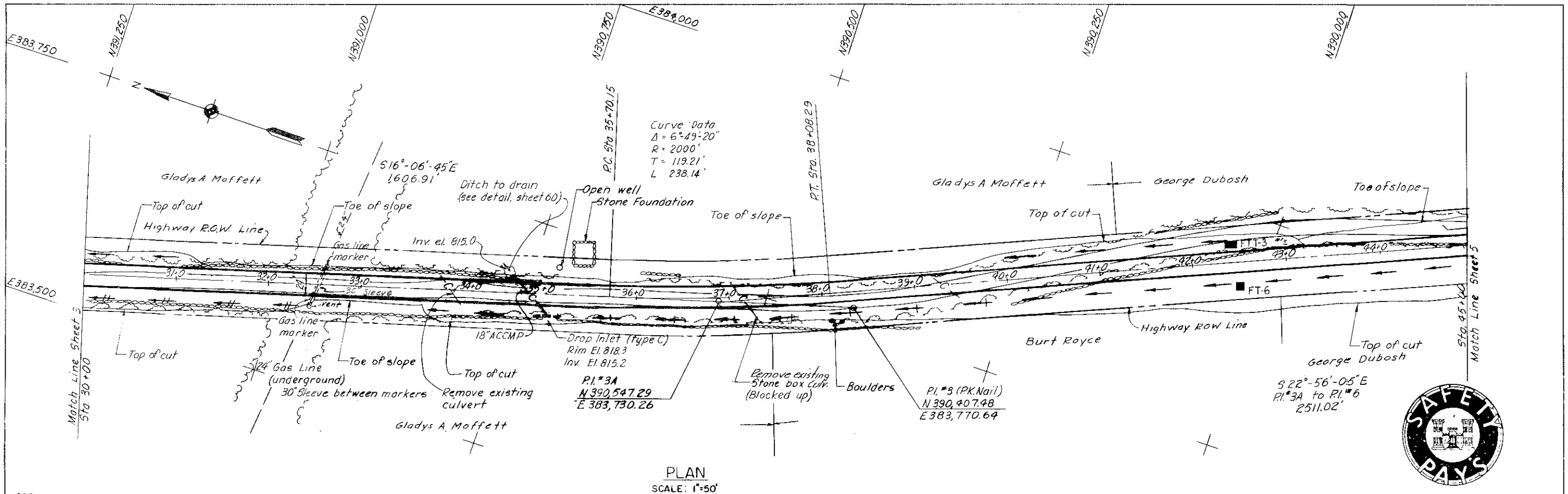
DATE APRIL 1964

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
PLAN AND PROFILE NO. 2
CHICOPEE RIVER MASSACHUSETTS

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-015-64-43

DRAWING NUMBER
CON 9

SHEET 3



U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.M.CL.	D.L.W.	WBM

SUBMITTED: CHIEF UTILITIES SECTION
REVIEWED: HIGHWAY LOCATION ENGR.
REVIEWED: PROJECT ENGINEER
APPROVED: CHIEF ENGINEERING DIVISION
DATE APRIL 1964

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
PLAN AND PROFILE NO. 3
CHICOPEE RIVER MASSACHUSETTS

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON 9
SHEET 4

E384,250 N389,750 N389,500 E384,500 N389,250 E384,750 N389,000

Sheet 4

Match Line Sta 45+00

E384,000

Toe of slope

Top of cut

Toe of slope

P.O.L. #5 (P.K. Nail)
Sta. 47+39.06
N389,580.31
E384,139.41

Top of cut

Highway R.O.W. Line

Toe of slope

Burt Royce

Boulders

George Dubosh

P.C. Sta 51+24.47 B
= Sta 51+28.53 F

Heirs of Blanchard

Highway R.O.W. Line

Curve Data
Δ = 88°-43'-00"
T = 1075.63'
R = 1100'
L = 1703.24'

George Dubosh

Open field

Top of cut

Top of cut

Woods

Barn to be removed by others

Match Line Sta 60+00 Sheet 6

FD-66

Pole #32

Mail Box

Barn

Ho. (2 story)

P.I. #3A To P.I. #6
S 22°-56'-05" E
2511.02'

P.I. #6 (Stake)
N 388,234.76
E 384,708.76

To P.I. #6
N 68°-20'-55" E
3,369.90

PLAN
SCALE: 1" = 50'

PROFILE
SCALE: HORZ. 1" = 50'
VERT. 1" = 10'

+0.64%

Finish grade

Existing ground surface

400' V.C.

-6.00%

GRAPHIC SCALES
1" = 10'
1" = 50'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

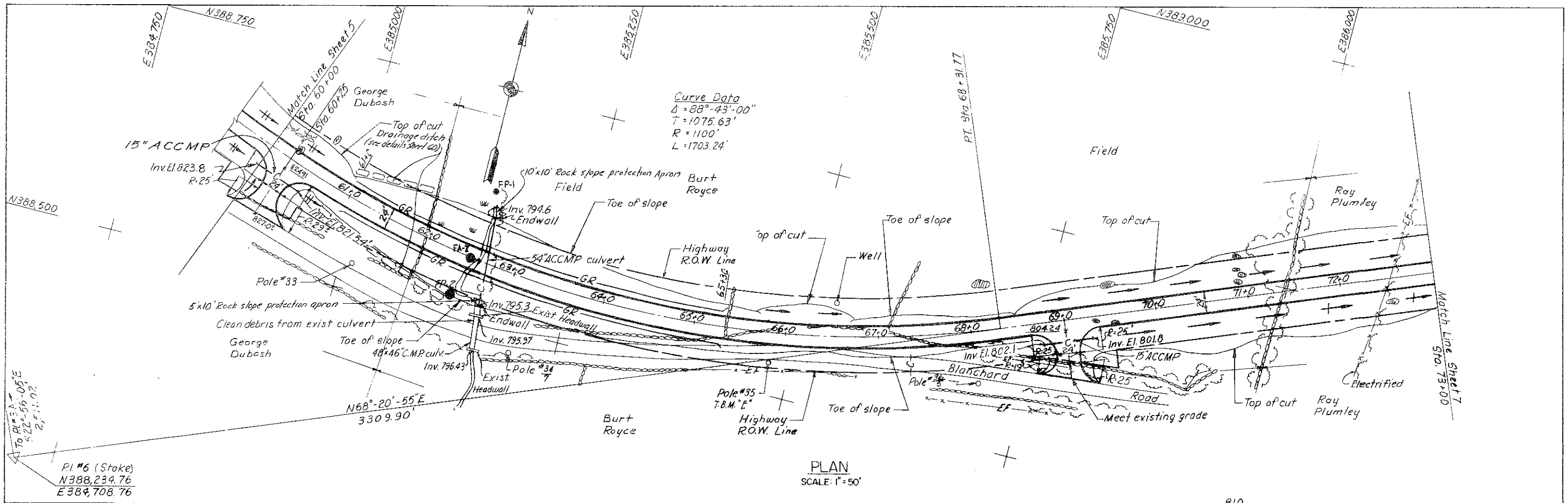
DES. BY	DR. BY	CK. BY
H.McL.	D.L.W.	

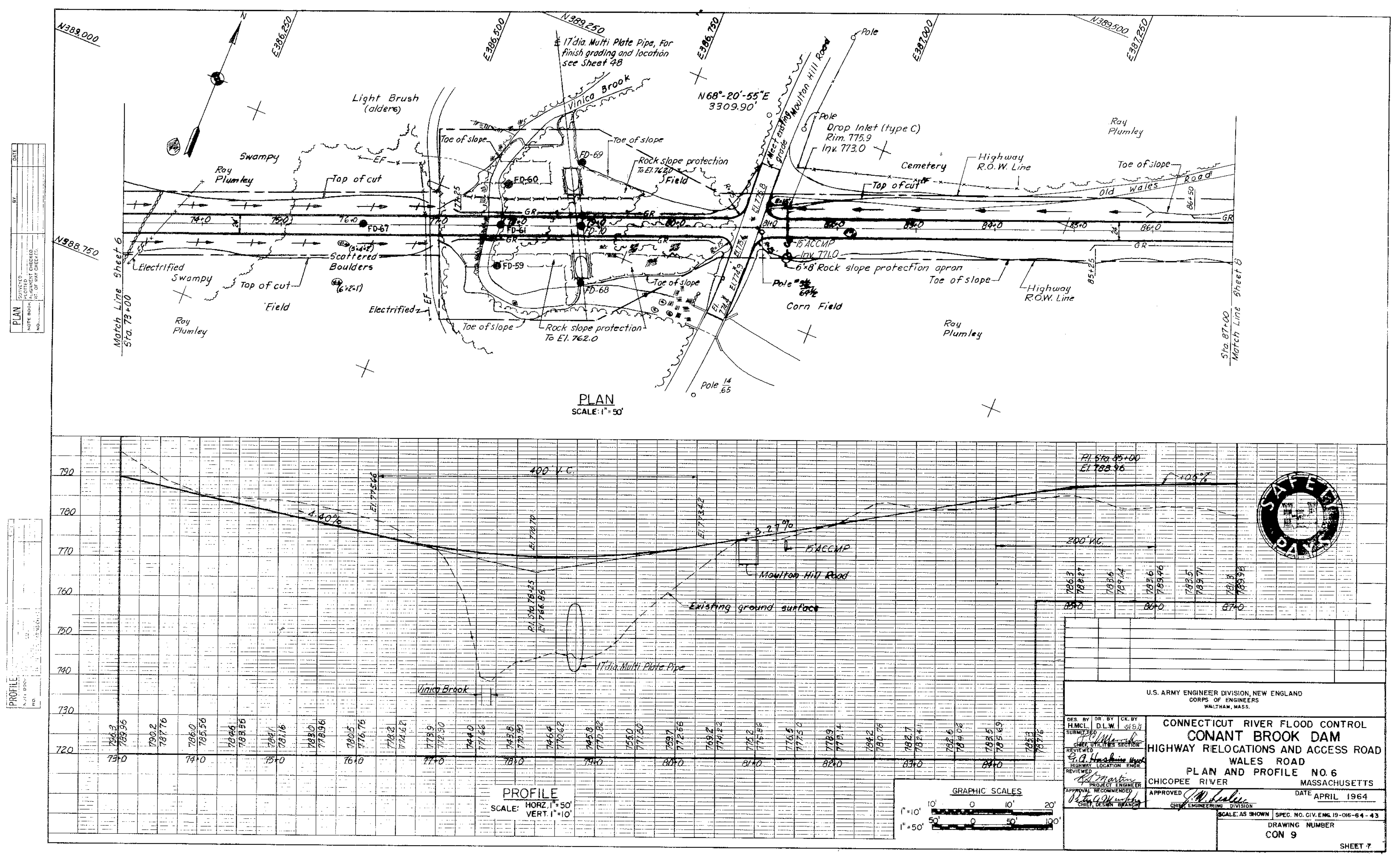
SUBMITTED: Chief, Utilities Section
REVIEWED: Highway Location Engr.
REVIEWED: Project Engineer
APPROVAL RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Engineering Division

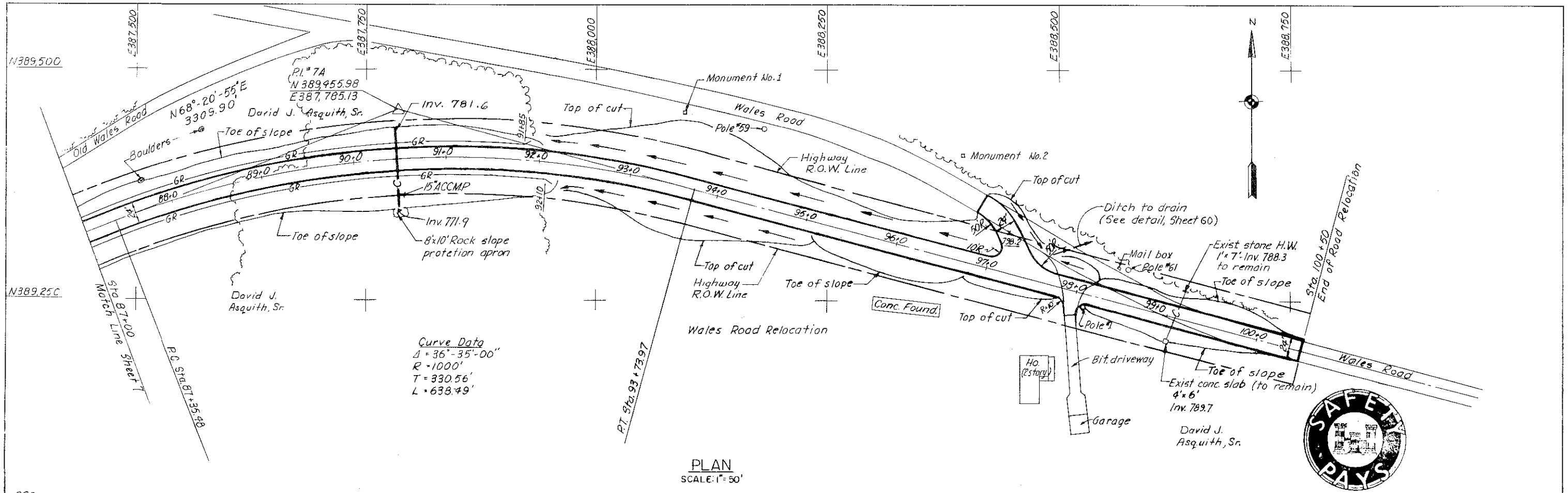
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
PLAN AND PROFILE NO. 4
CHICOPEE RIVER — MASSACHUSETTS

DATE APRIL 1964

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON - 9
SHEET 5


E384,750
N388,750
E385,000
E385,250
E385,500
N383,000
E386,000
Match Line Sheet 5 Sta. 60+00
Sta. 60+25
George Dubosh
15" ACCMP
Inv. El. 823.8
R=25'
Top of cut Drainage ditch (see details Sheet 6)
10'x10' Rock slope protection Apron
Field
Burt Royce
FP-1
Inv. 794.6
Endwall
Toe of slope
Curve Data
Δ = 88°-43'-00"
T = 1075.63'
R = 1100'
L = 1703.24'
P.T. Sta. 68+31.77
Field
Ray Plumley
N388,500
Inv. El. 821.34
24"
GR
61+0
62+0
63+0
64+0
65+0
66+0
67+0
68+0
69+0
70+0
71+0
72+0
54"ACCMP culvert
Highway R.O.W. Line
Top of cut
Toe of slope
Well
Pole #33
5'x10' Rock slope protection apron
Clean debris from exist culvert
Inv. 795.3 Exist. Headwall
Endwall
Inv. 795.37
48"x46" C.M.P. culv.
Inv. 796.43
Exist. Headwall
Pole #34
Toe of slope
Pole #35
T.B.M. "E"
Highway R.O.W. Line
Toe of slope
Pole #36
Blanchard Road
Inv. El. 802.1
R=25'
15" ACCMP
Inv. El. 801.8
Meet existing grade
Top of cut
Ray Plumley
Electrified
Match Line Sheet 7 Sta. 73+00
N68°-20'-55"E
330.90'
To P.I. #5 Δ = 56°-05'-12" R = 22°-56'-05" L = 2,211.02'
P.I. #6 (Stoke)
N388,234.76
E384,708.76
PLAN
SCALE: 1" = 50'
PROFILE
-6.00%
300' V.C.
El. 820.50
54" ACCMP culvert
℄ Brook
Existing ground surface
Finish grade
-1.033%
-4.60%
300' V.C.
P.I. Sta. 70+00
El. 803.16
810
800
790
780
Existing ground surf.
Finish grade
-4.60%
8036 794.36
8066 792.16
8096 789.96
780
PROFILE
SCALE: HORIZ. 1" = 50' VERT. 1" = 10'
GRAPHIC SCALES
1" = 10'
1" = 50'
PROFILE
PLAN
NOTE BOOK
NO.
REVISIONS
DATE
DESCRIPTION
BY
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
DES. BY H. Mc L.
DR. BY D.L.W.
CK. BY NSM
SUBMITTED
CHIEF, DESIGN BRANCH
REVIEWED
CHIEF, LOCATION BRANCH
RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
PLAN AND PROFILE NO. 5
CHICOPEE RIVER MASSACHUSETTS
DATE APRIL 1964
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON-9
SHEET 6


PLAN
SCALE: 1" = 50'
Match Line Sheet 6
Sta. 73+00
Match Line Sheet 8
Sta 87+00
17' dia. Multi Plate Pipe, For finish grading and location see Sheet 48
Vinica Brook
N68°-20'-55"E
3309.90'
Moulton Hill Road
Meet existing grade
Drop Inlet (type C)
Rim. 775.9
Inv. 773.0
15" ACCMP
Inv. 771.0
6'x8' Rock slope protection apron
Rock slope protection To El. 762.0
Toe of slope
Top of cut
Highway R.O.W. Line
Old Wales Road
Cemetery
Corn Field
Light Brush (alders)
Swampy
Scattered Boulders
Electrified
Field
Ray Plumley
PROFILE
SCALE: HORZ. 1" = 50' VERT. 1" = 10'
400' V.C.
200' V.C.
-4.40%
+3.27%
+0.57%
P.I. Sta 85+00
El. 788.96
P.I. Sta 78+25
El. 766.86
Existing ground surface
17' dia. Multi Plate Pipe
Vinica Brook
GRAPHIC SCALES
1" = 10'
1" = 50'
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
PLAN AND PROFILE NO. 6
CHICOPEE RIVER
MASSACHUSETTS
DATE APRIL 1964
SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON 9
SHEET 7



PLAN

PROFILE

NOTE BOOK NO.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H. Mc L.	D.L.W.	

SUBMITTED:
CHIEF, UTILITIES SECTION

REVIEWED
HIGHWAY LOCATION ENGR.

REVIEWED:
PROJECT ENGINEER

APPROVAL RECOMMENDED:
CHIEF, DESIGN BRANCH

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
PLAN AND PROFILE NO. 7
CHICOPEE RIVER MASSACHUSETTS

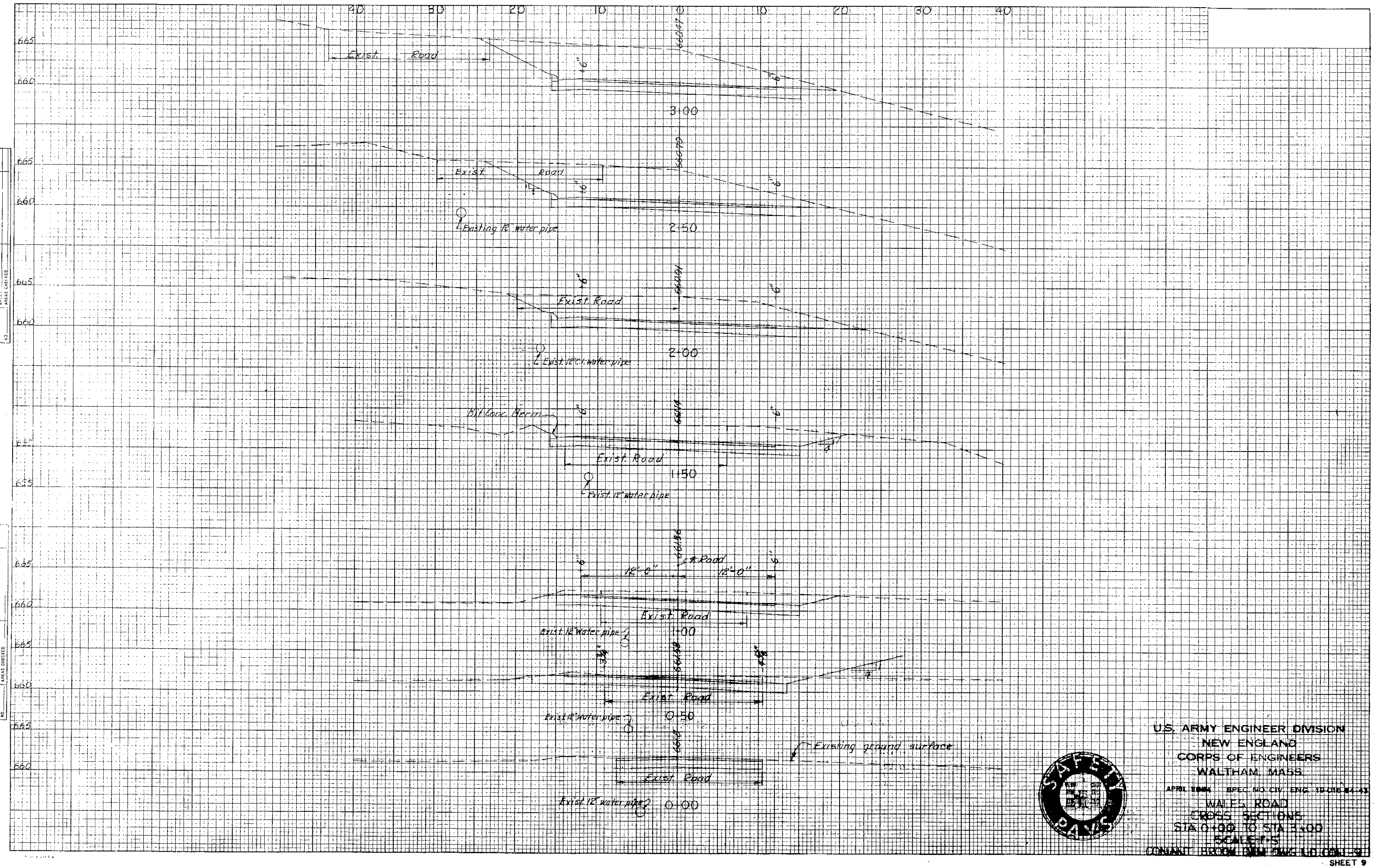
APPROVED:
CHIEF ENGINEERING DIVISION

DATE: APRIL 1964

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-014-64-43

DRAWING NUMBER
CON - 9

SHEET



FINAL SURVEY — SURVEYED / PLOTTED / TEMPLATE / AREAS CHECKED — NOTE BOOK — NO. — BY — DATE

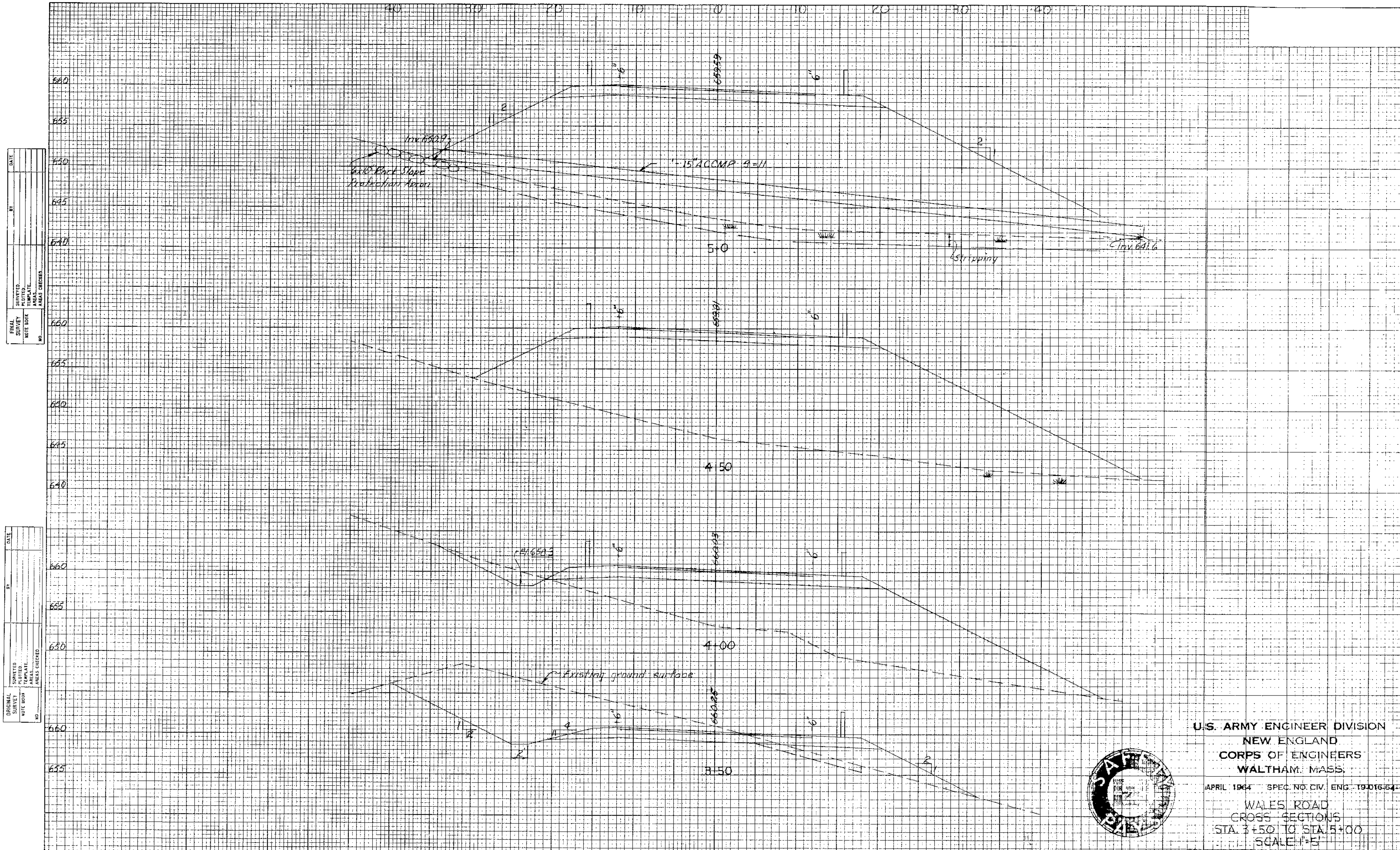
ORIGINAL SURVEY — SURVEYED / PLOTTED / TEMPLATE / AREAS CHECKED — NOTE BOOK — NO. — BY — DATE

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC NO CIV ENG 1D-ORE 64-43

WALES ROAD
CROSS SECTIONS
STA 0+00 TO STA 3+00
SCALE 1"=5'
CONFORMED FROM DWG NO CON-9

SHEET 9

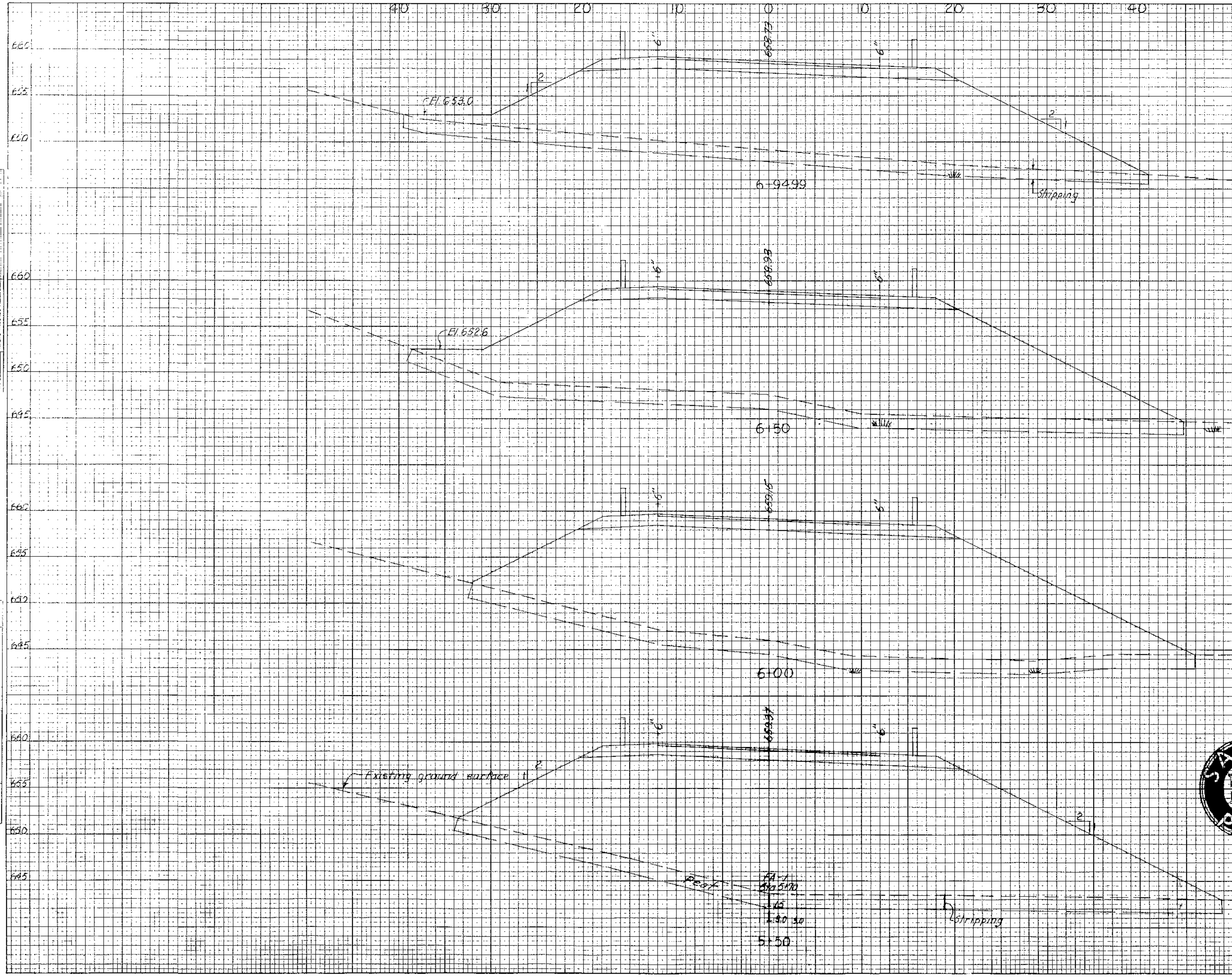


U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 3+50 TO STA. 5+00
SCALE 1"=5'

CONANT BROOK DAM DWG. NO. CON-1-19
SHEET 10



U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC NO CIV ENG 19-016-64-43

WALLS ROAD
CROSS SECTIONS
STA 5+50 TO STA 6+94.99
SCALE 1"=5'
CONANT BROOK DAM DWG NO CON-9

SHEET 11

FINAL SURVEY	
NOTE BOOK	SURVEYED
	PLOTTED
	TEMPLATE
	AREAS
NO	AREAS CHECKED
BY	DATE

ORIGINAL SURVEY	
NOTE BOOK	SURVEYED
	PLOTTED
	TEMPLATE
	AREAS
NO	AREAS CHECKED
BY	DATE

FINAL SURVEY
NOTE BOOK
NO

SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED

BY

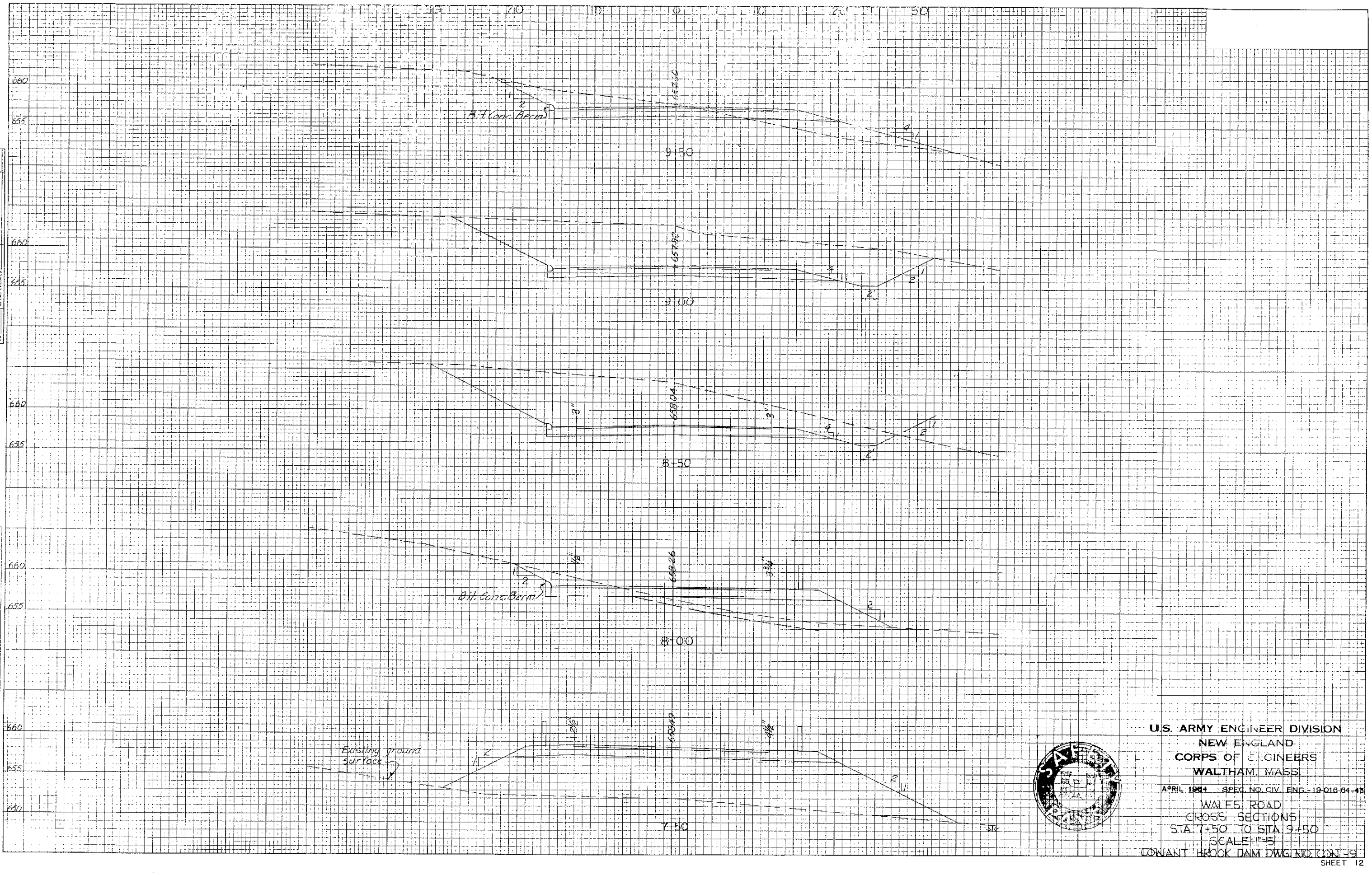
DATE

ORIGINAL SURVEY
NOTE BOOK
NO

SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED

BY

DATE



U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-45

WALES ROAD
CROSS SECTIONS
STA. 7+50 TO STA. 9+50
SCALE 1"=5'
CONANT BROOK DAM DWG. NO. CON-9

SHEET 12

FINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
NO. ____ BY ____ DATE ____

ORIGINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
NOTE BOOK
NO. ____ BY ____ DATE ____

40 30 20 10 0 10 20 30 40

660
655
650
645
640
635
630

Rock slope protection
Gravel bedding
El 654.0
2
1
1½
FD-56
Sta. 10+75
11+00
65.17
65.47
El 654.0
12.9
15 dia. Multh Plate Pipe
(not shown)
Rock slope protection
Gravel bedding
FD-55
Sta 10+69
Brook
FD-57
Sta 10+30
10+50
20.0
Existing ground surface
El 654.0
Gravel bedding
Rock slope protection
64.98
200
10+00
FD-58
Sta 9+05
9+70

SAFETY PASS

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

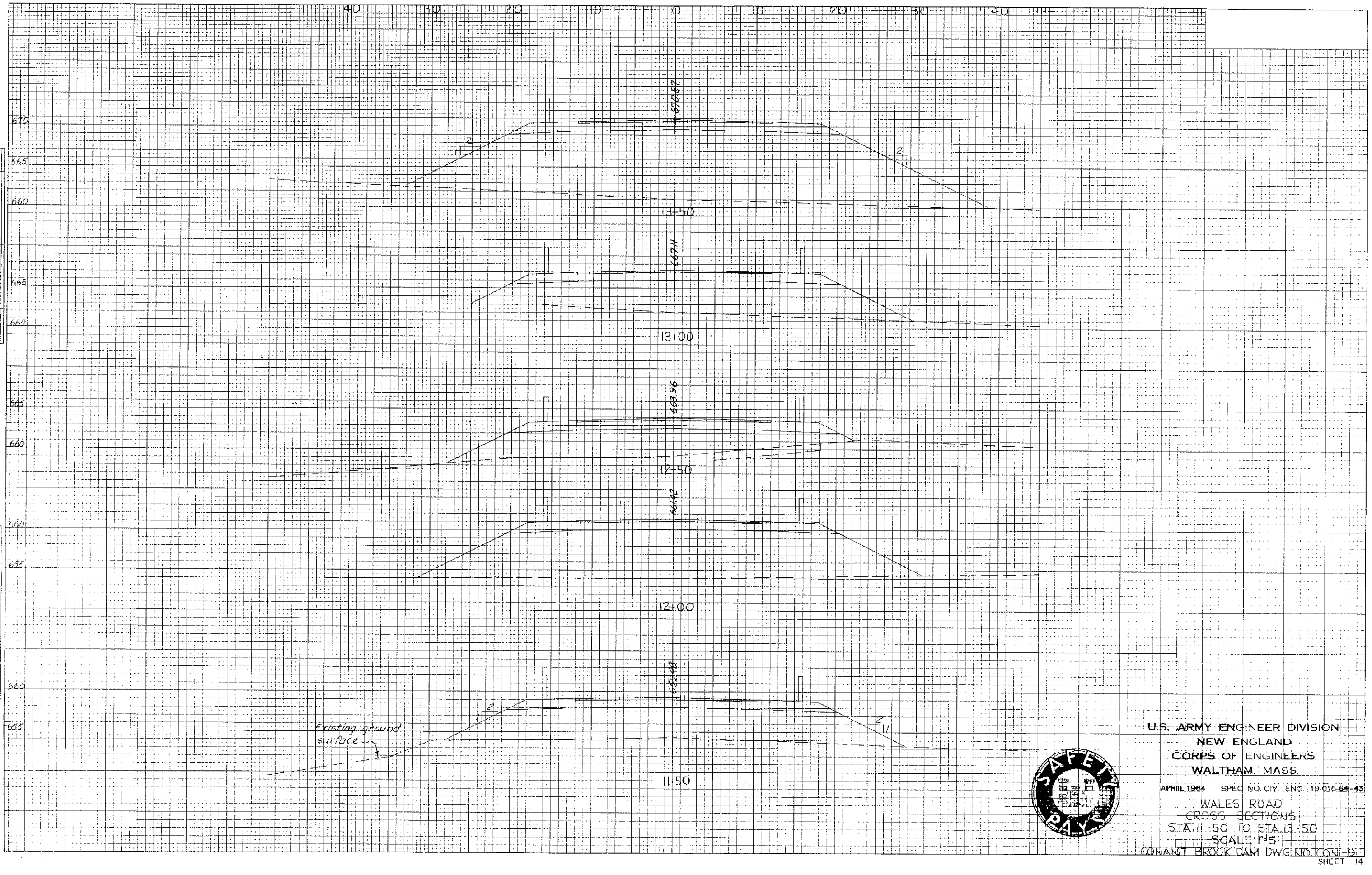
APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-45

WALES ROAD
Brook CROSS SECTIONS
STA 10+00 TO STA 11+00
SCALE 1" = 5'
CONANT BROOK DAM DWG. NO. CON-9

SHEET 13

NO	FINAL SURVEY	BY	DATE
	SURVEYED		
	PLOTTED		
	NOTE BOOK	TEMPLATE	
		AREAS	
		AREAS CHECKED	

NO	ORIGINAL SURVEY	BY	DATE
	SURVEYED		
	PLOTTED		
	NOTE BOOK	TEMPLATE	
		AREAS	
		AREAS CHECKED	



U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 11+50 TO STA. 13+50
SCALE: 1"=5'

CONANT BROOK DAM DWG. NO. CON-9

SHEET 14

50 40 30 20 10 0 10 20 30 40 50

685
680
675
670
665

684.66

679.97

1:2

2:1

15+00

14+50

1:2

2:1

Existing ground surface

14+00

ORIGINAL SURVEY	SURVEYED BY	DATE
NOTE BOOK	PLOTTED BY	
	TRACED BY	
	AREAS CHECKED BY	
NO		

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG.-19 016-64-43

WALLES ROAD
CROSS SECTIONS
STA 14+00 TO STA 15+00
SCALE 1"=5'
CONANT BROOK DAM DWG NO CON-9

SHEET 15

PLATE 3 CROSS SECTION B.P.R. STANDARD

40 30 20 10 0 10 20 30 40

705

700

695

690

685

680

675

670

70544

69995

69966

69936

3"

1

2

4

11+00

16+50

16+00

15+50

Existing ground surface

FINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
NOTE BOOK
AREAS
AREAS CHECKED
NO
BY
DATE

ORIGINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
NOTE BOOK
AREAS
AREAS CHECKED
NO
BY
DATE

PLATE 3 CROSS SECTION H & H STANDARD

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. - 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 15+50 TO STA. 17+00
SCALE 1"=5'
CONANT BROOK DAM DWG NO CON-9

SHEET 16

FINAL SURVEY
NOTE BOOK
NO.
TURNETED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
DATE
BY

ORIGINAL SURVEY
NOTE BOOK
NO.
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
DATE
BY

40 30 20 10 0 10 20 30 40

735
730
725
720
715
710
705

FD-63
NR
FT-6
NR
FD-62
NR
FT-9
NR
Existing ground surface

19+50
19+00
18+50
18+00
17+50

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 17+50 TO STA. 19+50
SCALE: 1"=5'
CONANT BROOK DAM DWG. NO. CON-9

SHEET 17

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APPL. 1964 SPEC. NO. CIV. ENG.-13-015-64-43

WALES ROAD
CROSS SECTIONS
STA 20+00 TO STA 22+50
SCALE 1"=5'

CONANT BROOK DAM DWG NO. CON-1-9

SHEET 18

20-00

20-50

21+00

21+50

22-00

22-50

Existing ground surface

Stripping

Shoulder

New Turn-off (or skew)

Existing Bituminous Rd

3" Shld

12' Gravel base

6" Bit. conc.

Widens cross Road

Existing Road

9" Gravel

ORIGINAL SURVEY
NOTE BOOK
NO.
SURVEYED
PLOTTED
TRACED
AREAS
AREAS CHECKED
BY
DATE

FINAL SURVEY
NOTE BOOK
NO.
SURVEYED
PLOTTED
TRACED
AREAS
AREAS CHECKED
BY
DATE

SHEET 19

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC NO CIV ENG 19-015-64-43

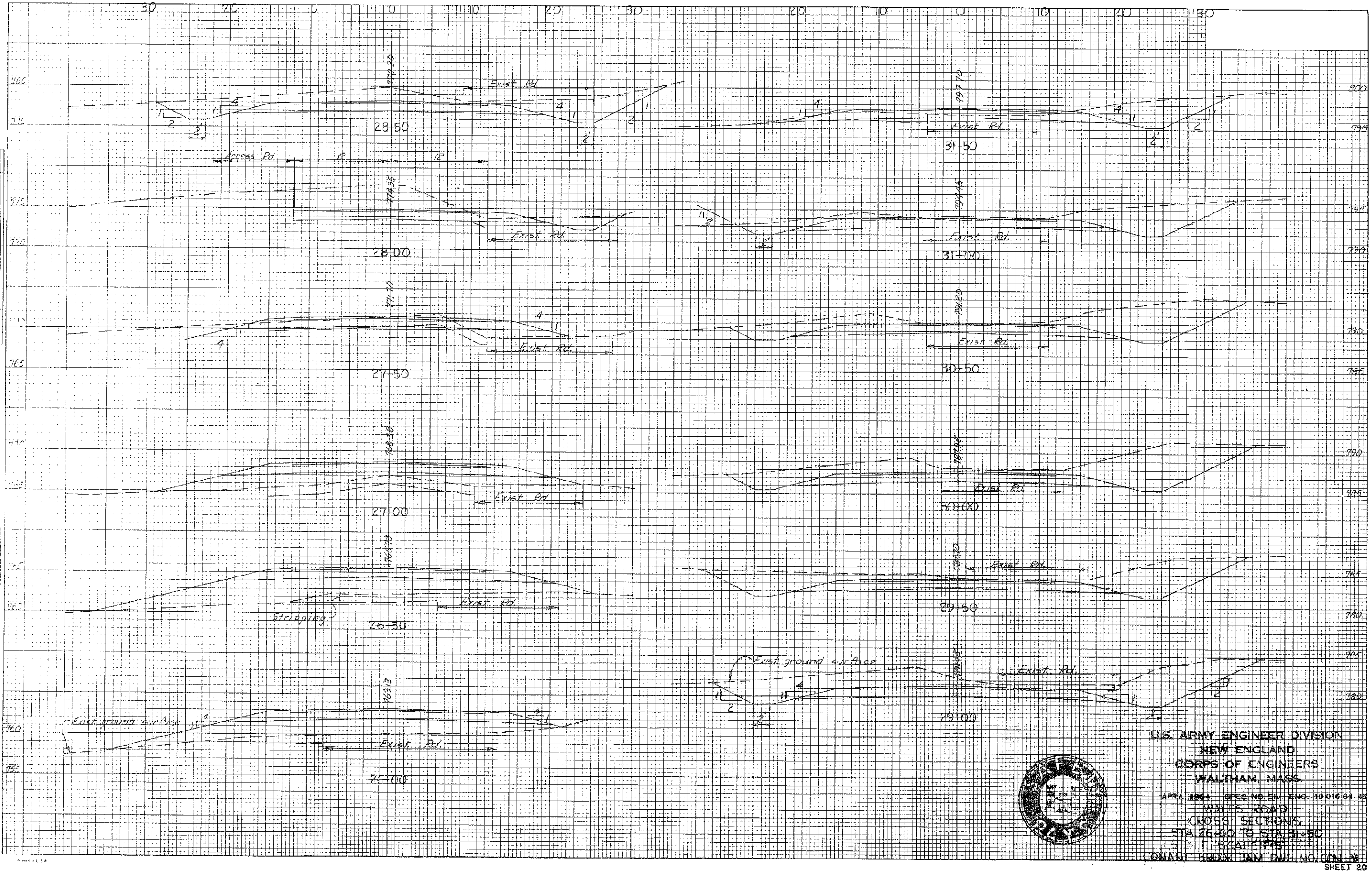
WALES ROAD
CROSS SECTIONS
STA 23+00 TO STA 25+50
SCALE 1"=5'

CONANT BROOK DAM DWG NO (CON-9)

ORIGINAL SURVEY
NOTE BOOK
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
NO. | BY | DATE

FINAL SURVEY
NOTE BOOK
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
NO. | BY | DATE

23+00
Existing Ground Surface
Stripping
Existing Road
17'
12'
4:1
6"
0.064
23+50
Existing Road
Slope Varies
Woodmans Cross Road
30' Graded Topsoil
19.5'
12'
4:1
13.34'
0.226
24-00
Existing Road
Slope Varies
Woodmans Cross Road
26.7'
12'
4:1
11.12'
0.244
24+50
Existing Road
Slope Varies
12'
4:1
8.14'
0.256
25-00
Existing Road
12.5'
12'
4:1
5.3'
0.268
25-50
Existing Rd
12'
4:1
2.5'
0.280



FINAL SURVEY — SURVEYED — PLOTTED — NOTE BOOK — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE — NO

ORIGINAL SURVEY — SURVEYED — PLOTTED — NOTE BOOK — TEMPLATE — AREAS — AREAS CHECKED — BY — DATE — NO

U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC. NO. ENG. 19-016-64-92

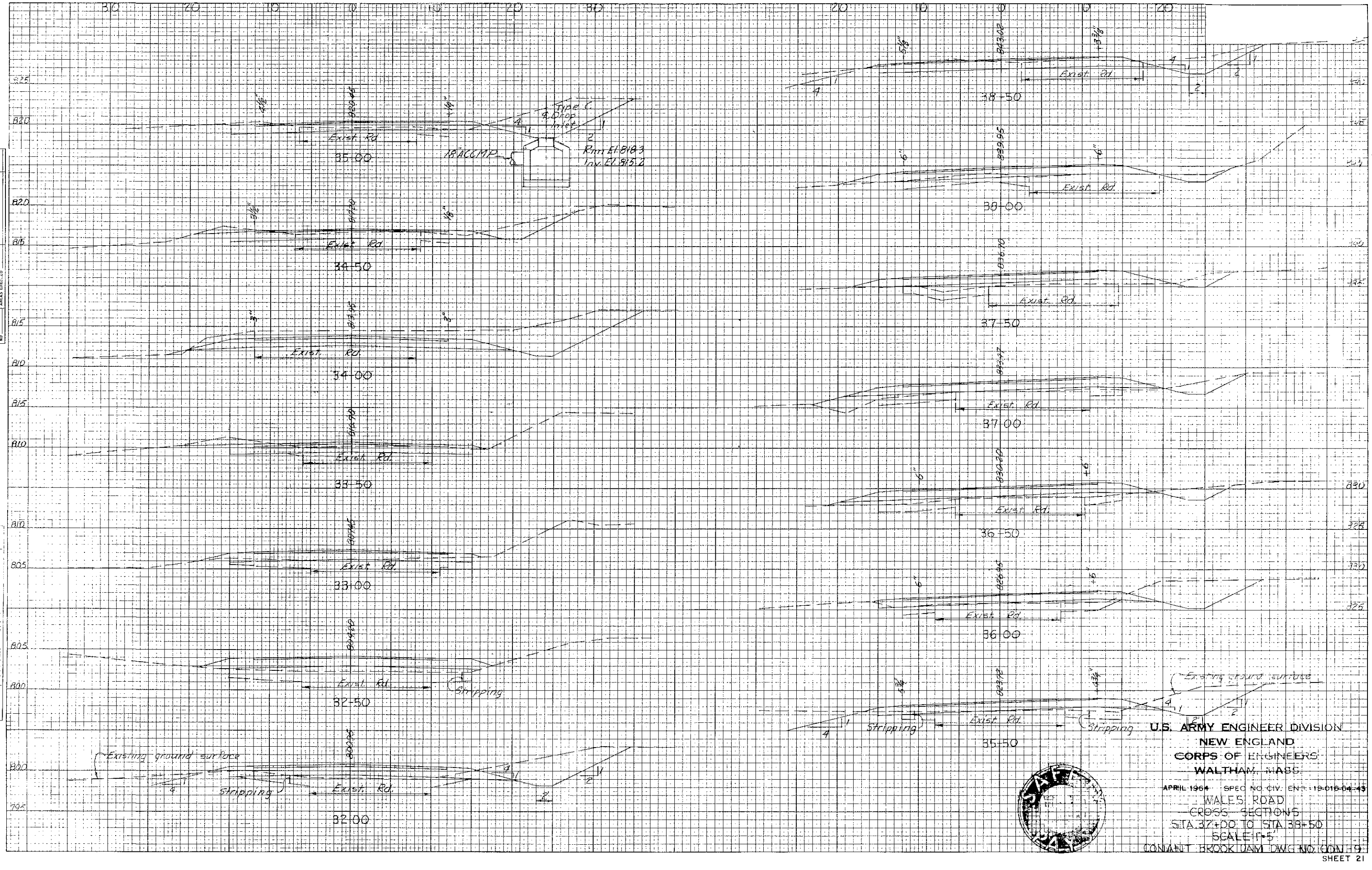
WALES ROAD
CROSS SECTIONS
STA 26+00 TO STA 31+50
SCALE 1"=5'

CONANT BROOK DAM ENG. NO. CON-19

SHEET 20

FINAL SURVEY	SURVEYED	BY	DATE
	PLOTTED		
WHITE PRINT	CHECKED		
	AREAS		
NO	AREAS CHECKED		

ORIGINAL SURVEY	SURVEYED	BY	DATE
	PLOTTED		
WHITE PRINT	CHECKED		
	AREAS		
NO	AREAS CHECKED		



U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC NO CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA 32+00 TO STA 38+50
SCALE 1"=5'

CONANT BROOK DAM DWG NO CON-9

SHEET 21

FINAL SURVEY	NOT REQUIRED
NOTE BOOK	PLOTTED
	TEMPLATE
	AREAS
NO	AREAS CHECKED

ORIGINAL SURVEY	SURVEYED
	PLOTTED
NOTE BOOK	TEMPLATE
NO	AREAS CHECKED

30 20 10 0 10 20 30

865
860
855
850
845
840

42+00
Exist Rd
Assumed rock surface
41+50
Exist Rd
Assumed rock surface
41+00
Exist Rd
Assumed rock surface
40+50
Exist Rd
40+00
Exist Rd
39+50
Exist Rd
Existing ground surface
39+00

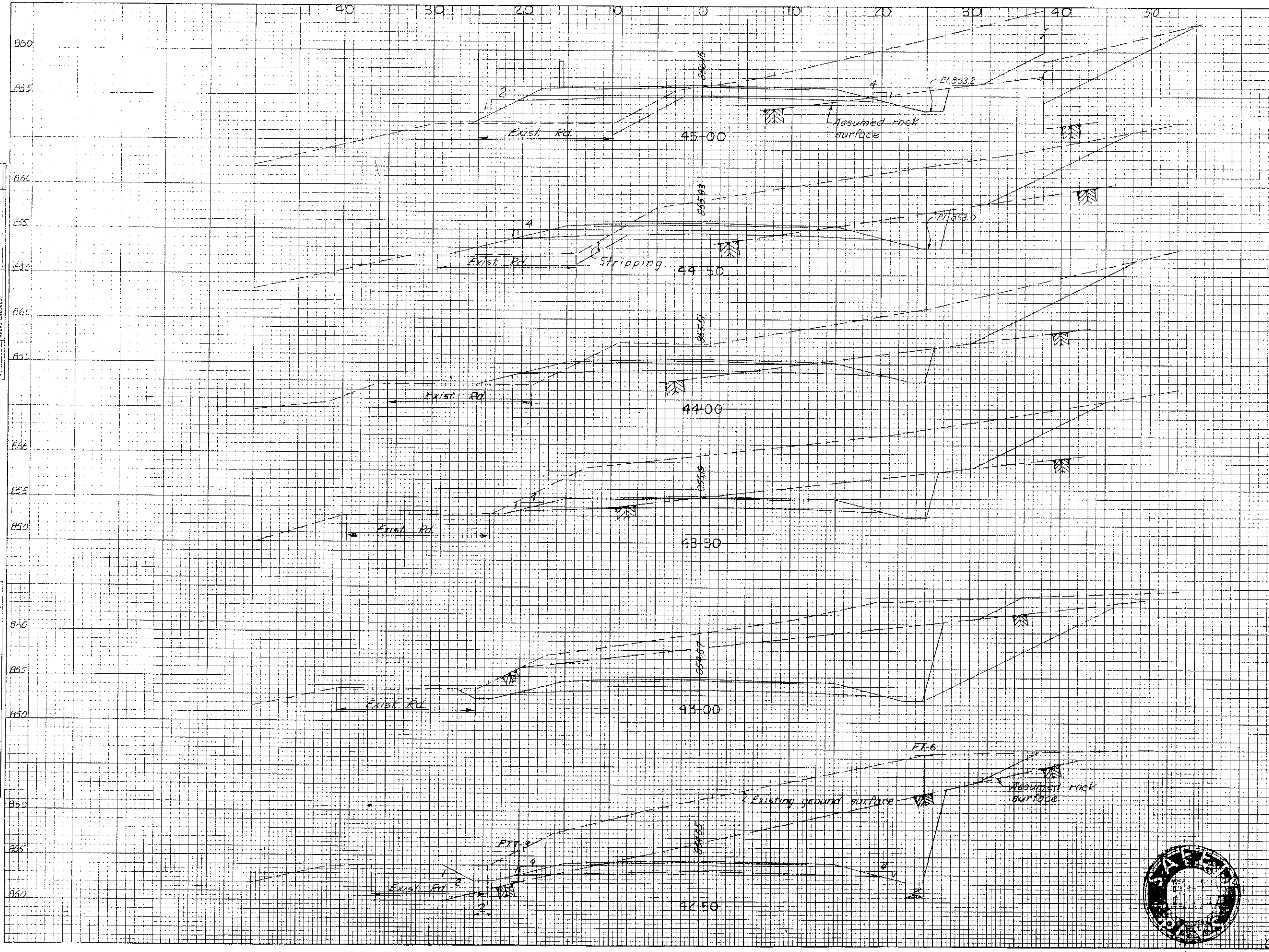
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APRIL 1964 SPEC. NO. CIV. ENG. 19-018-64-43

WALES ROAD
CROSS SECTIONS
STA 39+00 TO STA 42+00
SCALE 1"=5'

CONANT BROOK DAM DWG. NO. CON-5

SHEET 22



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APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-45

WALES ROAD
CROSS SECTIONS
STA 42+50 TO STA 45+00
SCALE 1"=5'

CONANT BROOK DAM DWG NO. CON-1-9
SHEET 23

FINAL SURVEY	BY	DATE
NOTE BOOK	SURVEYED	
NO.	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	

ORIGINAL SURVEY	BY	DATE
NOTE BOOK	SURVEYED	
NO.	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	

48+50

48+00

47+50

47+00

46+50

46+00

45+50

49+50

49+00

50+50

50+00

51+50

51+00

Assumed rock surface

Exist. Rd.

Fill to El. 855.4

Fill to El. 855.8

Fill to El. 855.0

El. 853.8

El. 853.6

El. 853.4

Exist ground surface

Stripping

FD-68

NR

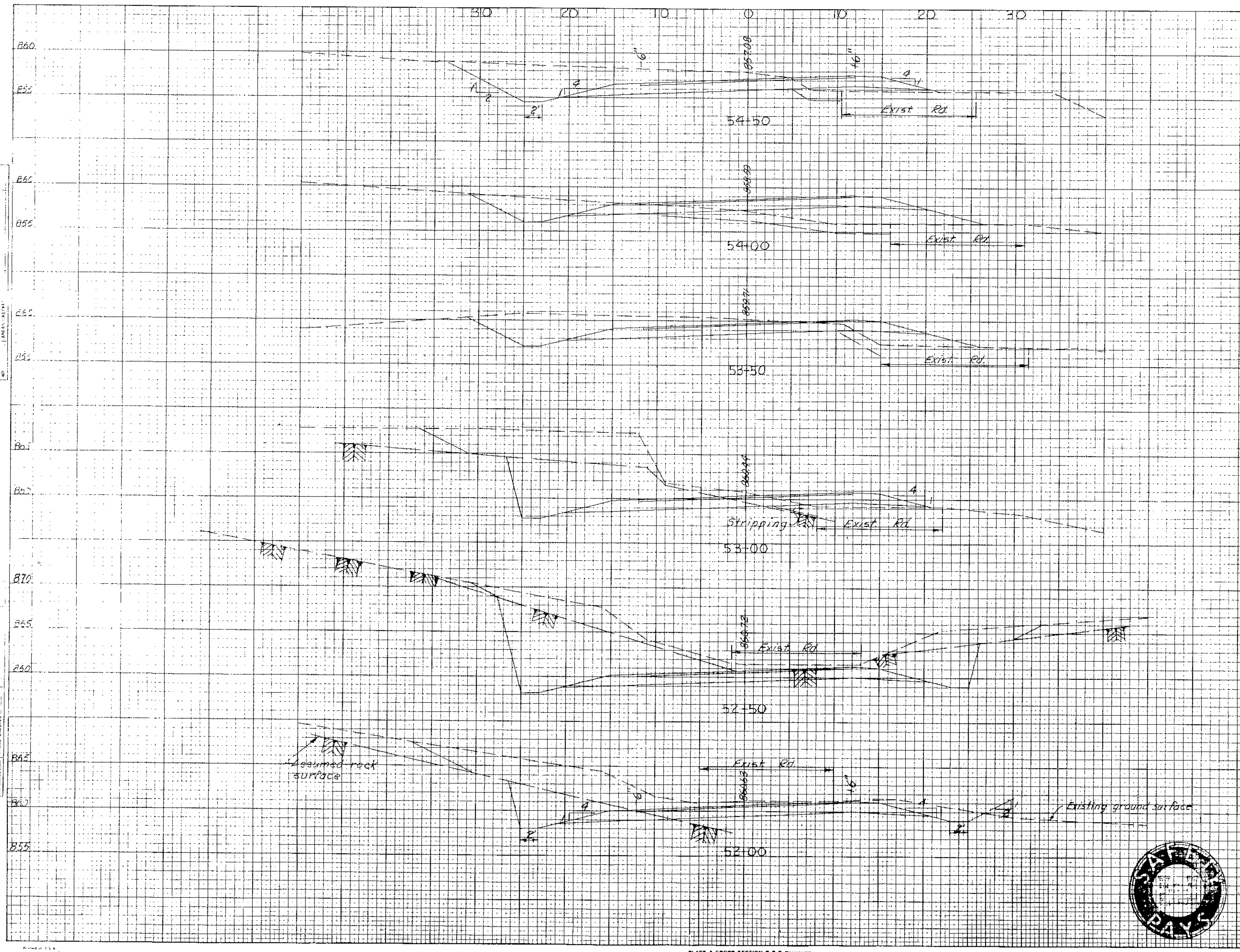
ATT-4

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APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-43

WALES ROAD
CROSS SECTIONS
STA 45+50 TO STA 51+50
SCALE 1"=5'
CONANT BROOK DAM DWG NO. CON-9

SHEET 24



U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA 52+00 TO STA 54+50
SCALE 1"=5'
CONANT BROOK DAM DWG. NO. CON-9

SHEET 25

40 30 20 10 0 10 20 30 40

845
840
57+50
6"
4'
2
1
4'
Exist Rd
6"
4'
2
1
4'
840
845
51+00
Exist. Rd.
850
845
56+50
Exist. Rd.
855
850
56+00
FD-65
Exist Rd.
855
850
55+50
Exist Rd.
Existing ground surface
6"
2
1
4'
855
850
55+00
6"
4'
Exist. Rd.
2'
4'

FINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
NOTE BOOK
NO
BY
DATE

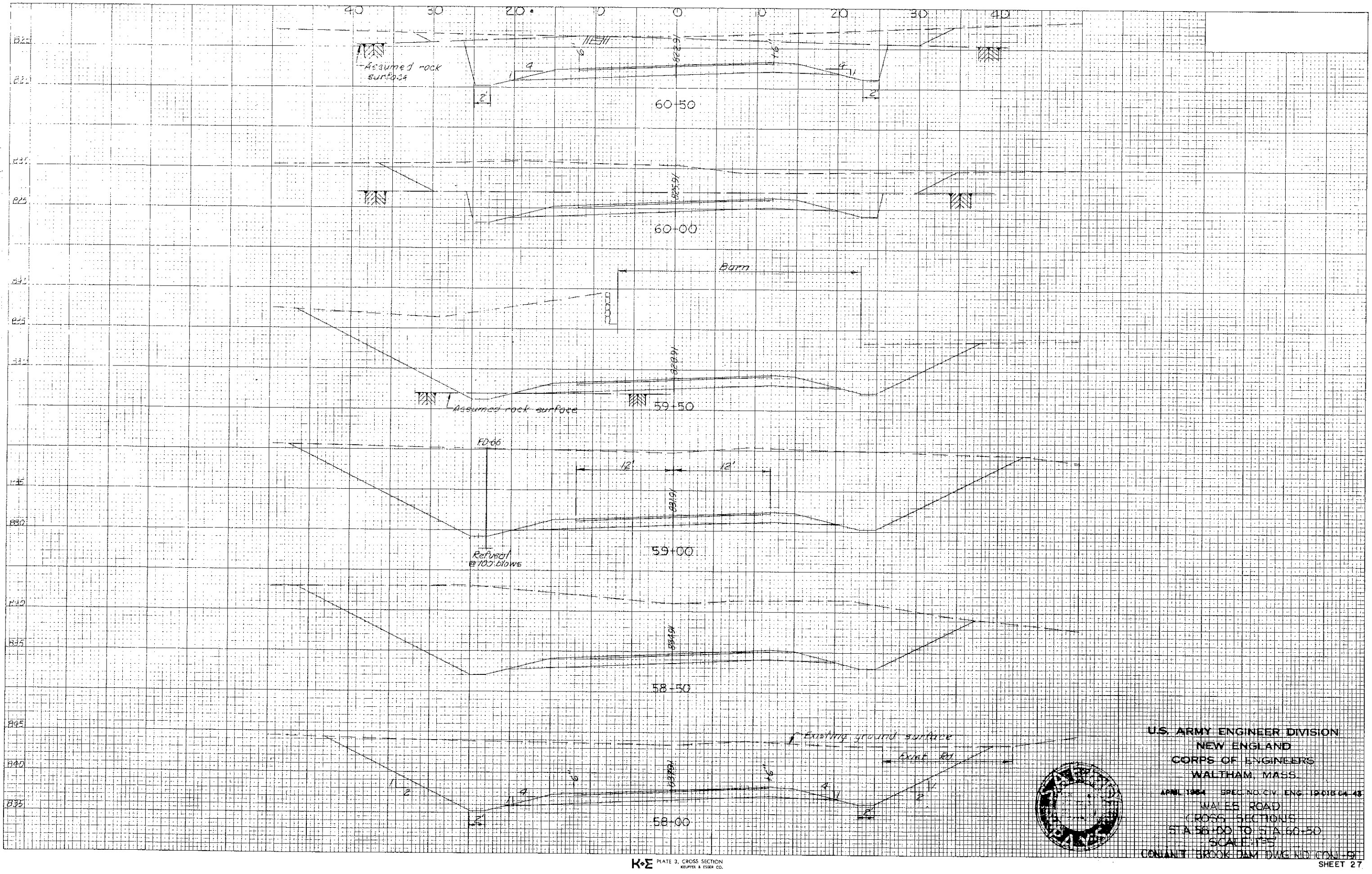
ORIGINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
AREAS
AREAS CHECKED
NOTE BOOK
NO
BY
DATE

U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-43

WALES ROAD
CROSS SECTIONS
STA 55+00 TO STA 57+50
SCALE 1"=5'
CONANT BROOK DAM DWG NO. (CON-9)

SHEET 26



ORIGINAL SURVEY — SPECIFIED / PLOTTED / FIELD BOOK / SHT. / NO. / DATE / CHECKED

K&E PLATE 3, CROSS SECTION KEUFFEL & ESSER CO.

U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC. NO. CIV. ENG. 1-0018 64-43

WALES ROAD
CROSS SECTIONS
STA 58+00 TO STA 60+50
SCALE 1"=5'

CONANT BROOK DAM DWG NO CON-9

SHEET 27

40 30 20 10 0 10 20 30 40

B10
B05
B00
795
B15
B10
B05
B00
890
B15
810
B20
815

FP-1
19 ± Soft

FA-2

6250

Refusal to auger

6+44

6+18

6+18

2 1

2 1

FP-2
Soft
4.50'

Brook

62+00

6+72

6+18

6+94

6+94

2 1

Existing ground surface

61+50

61+00

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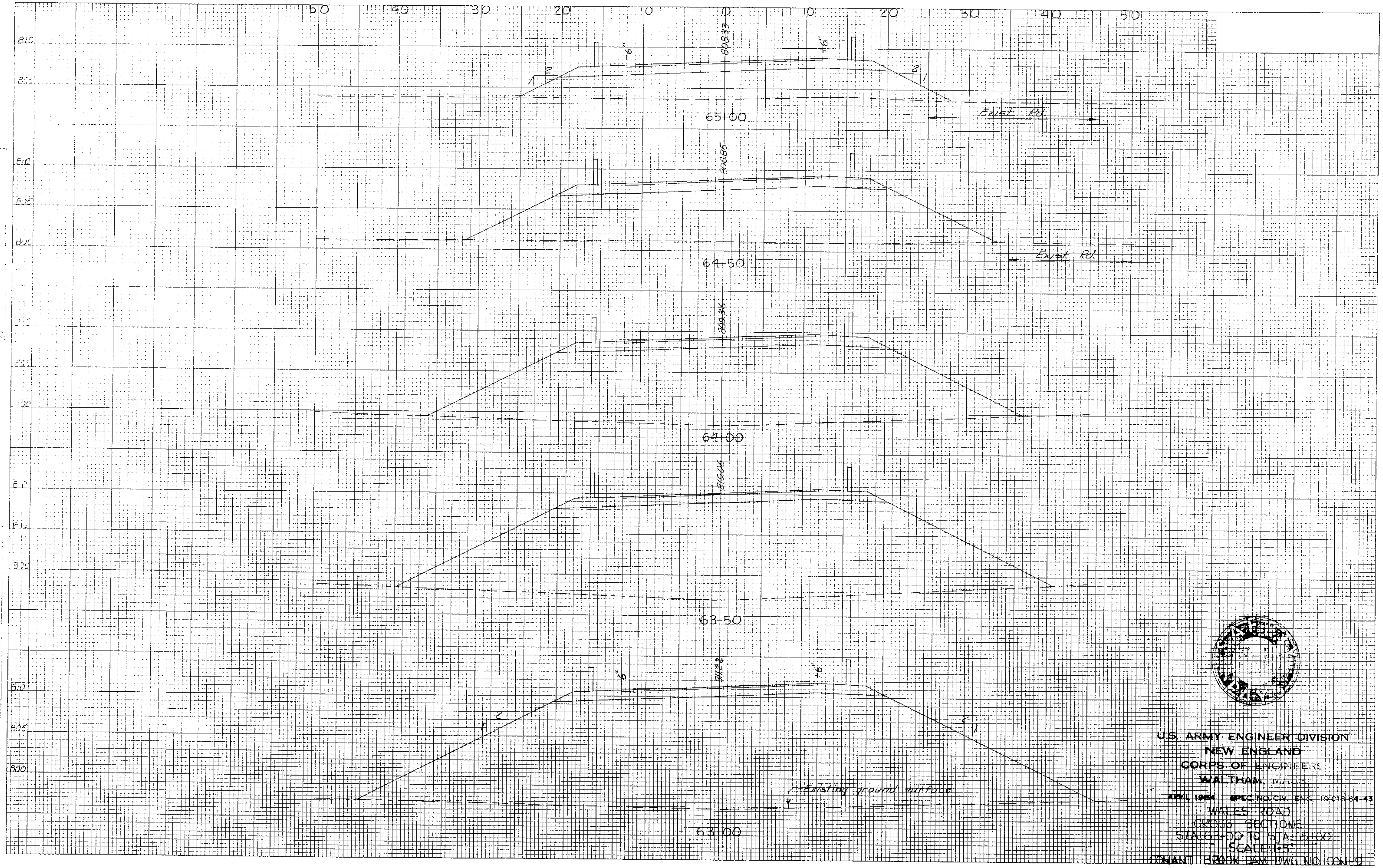
APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 6+00 TO STA. 62+50
SCALE: 1"=5'
CONANT BROOK DAM DWG. NO. CON-9

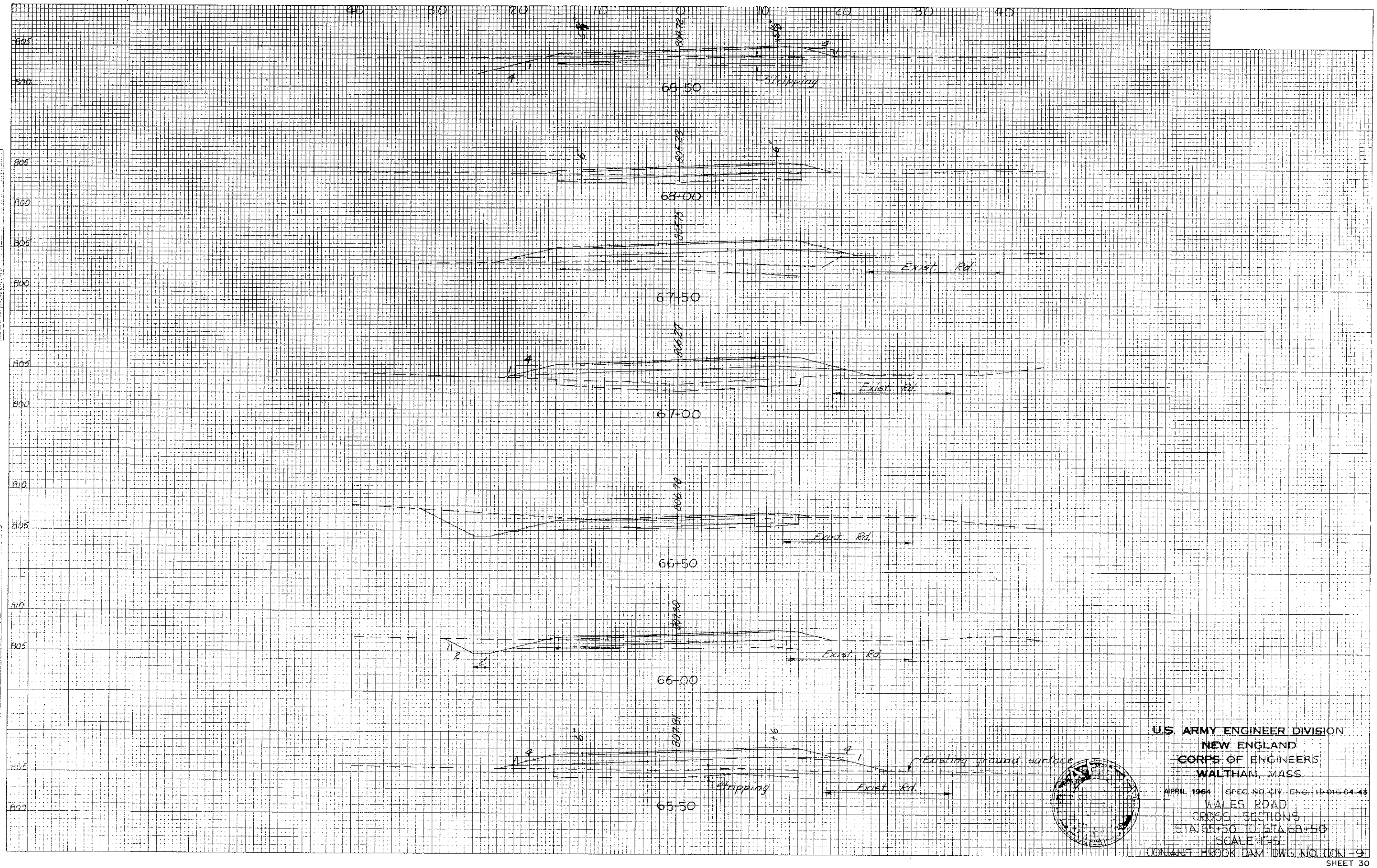
SHEET 28

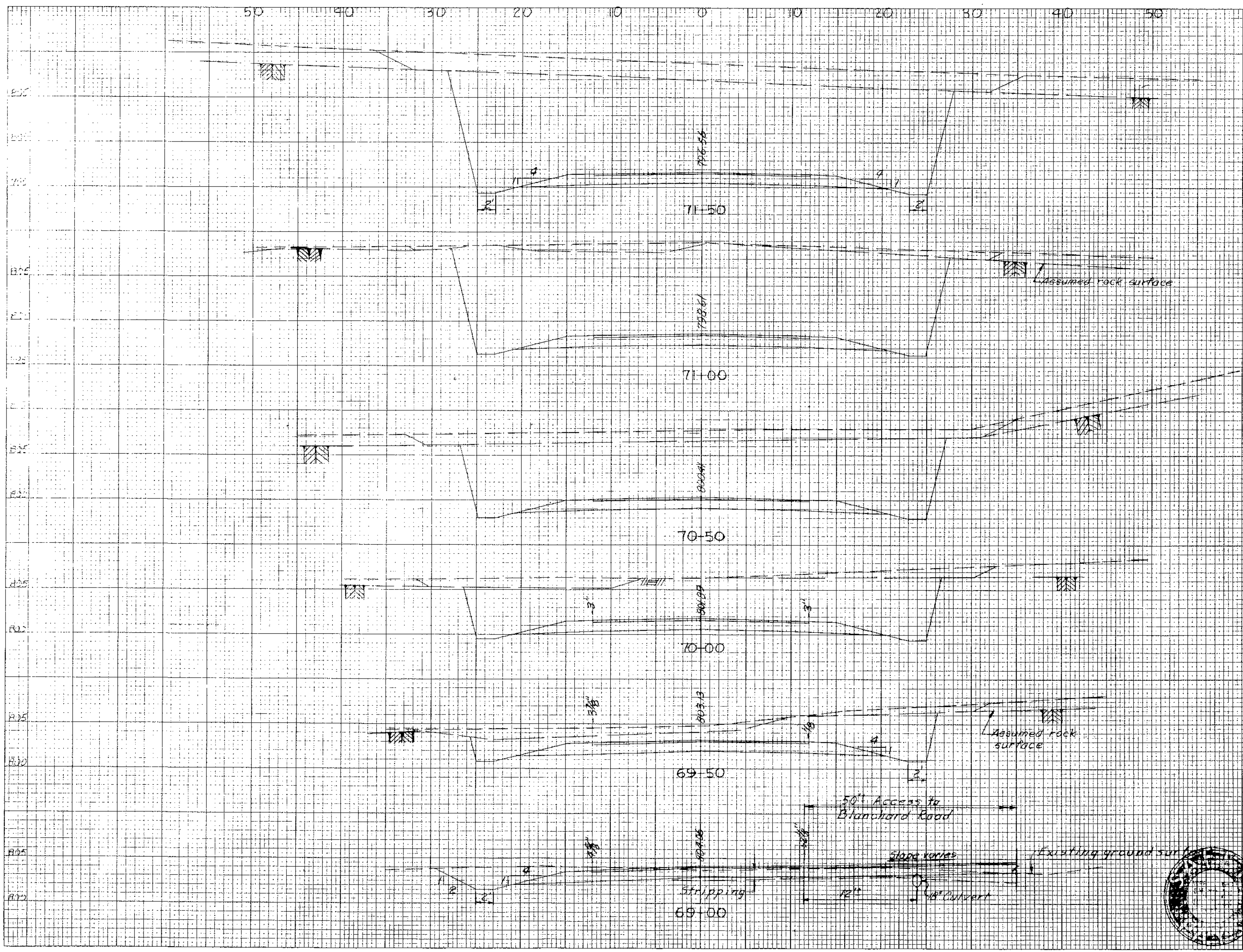
FINAL SURVEY
NOTE BOOK
NO.

K+E PLATE 3. CROSS SECTION
KEUFFEL & ESSER CO.



U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC NO. CIV. ENG. 19-016-64-43
WALES ROAD
CROSS SECTIONS
STA 63+00 TO STA 65+00
SCALE 1"=5'
CONANT BROOK DAM DWG. NO. CON-9
SHEET 29


40
30
20
10
0
10
20
30
40
805
800
795
790
785
780
775
770
765
760
755
750
745
740
735
730
725
720
715
710
705
700
695
690
685
680
675
670
665
660
655
650
645
640
635
630
625
620
615
610
605
600
595
590
585
580
575
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565
560
555
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535
530
525
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515
510
505
500
495
490
485
480
475
470
465
460
455
450
445
440
435
430
425
420
415
410
405
400
395
390
385
380
375
370
365
360
355
350
345
340
335
330
325
320
315
310
305
300
295
290
285
280
275
270
265
260
255
250
245
240
235
230
225
220
215
210
205
200
195
190
185
180
175
170
165
160
155
150
145
140
135
130
125
120
115
110
105
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
5
10
15
20
25
30
35
40
45
68-50
Stripping
Existing ground surface
Exist. Rd.
68-00
67-50
67-00
66-50
66-00
65-50
Stripping
Existing ground surface
Exist. Rd.
FINAL SURVEY
ORIGINAL SURVEY
U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
APRIL 1964 SPEC. NO. CIV. ENG. 19-015-64-43
WALES ROAD
CROSS SECTIONS
STA 65+50 TO STA 68+50
SCALE 1"=5'
CONANT BROOK DAM DWG NO. CON-12
SHEET 30



U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 69+00 TO STA. 71+50
SCALE 1"=5'

CONANT BROOK DAM DWG. NO. CON-9

SHEET 31

FINAL SURVEY
SURVEYED
TRACED
NOTE BOOK
MISC.
DATE
BY
CHK'D

ORIGINAL SURVEY
DATE
BY
CHK'D

40 30 20 10 0 10 20 30 40

785
780
775
770
765
760
755
750
745
740
735
730
725

14+50
14+00
13+50
13+00
12+50
12+00

Assumed rock surface
Existing ground surface
Assumed rock surface

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APRIL 1964 SPEC. NO. CIV. ENG - 19-016-64-43

MALES ROAD
CROSS SECTIONS
STA 12+00 TO STA 14+50
SCALE 1"=5'

CONVANT BROOK DAM DWG NO. CON-9

SHEET 32

SHEET 33

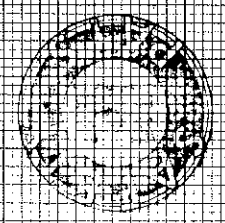
K&E PLATE 3, CROSS SECTION
KEUFFEL & ESSER CO.

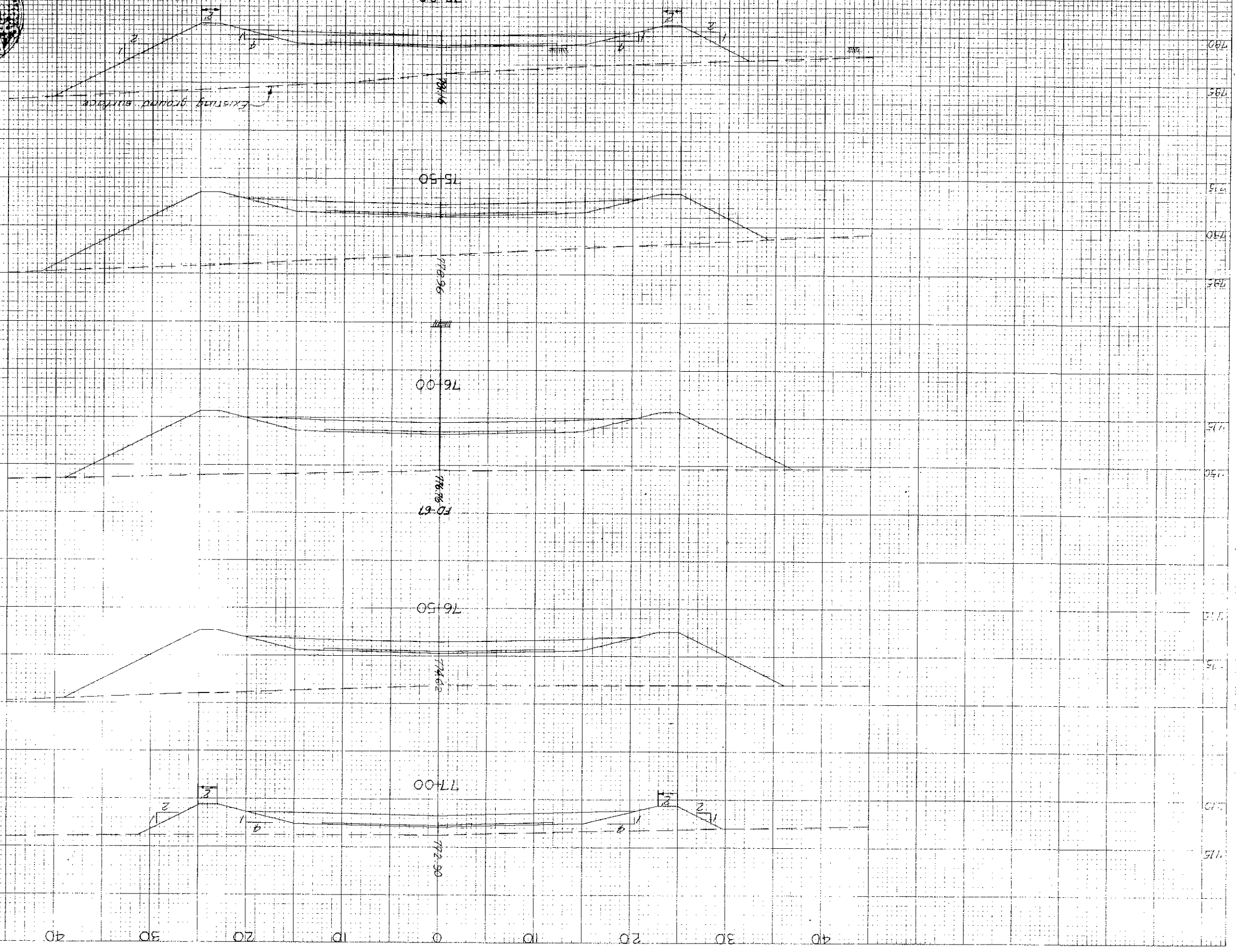
U.S. ARMY ENGINEER DIVISION
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APRIL 1964 SPEC NO CIV. ENG. -19-0164-43

WALES ROAD
CROSS SECTIONS
STA 5+00 TO STA 77+00
SCALE: 1"=5'

COANANT BROOK DAM DWG NO. CON-19





SHEET 34

K&E PLATE 3. CROSS SECTION
KEUFFEL & ESSER CO.

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APRIL 1964 — SPEC. NO. CIV. ENG.-19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 17+50 TO STA. 18+00
SCALE: VERT. 1"=5' HORZ. 1"=40'
CONVENT BROOK DAM DWG. NO. CON.-9

ORIGINAL SURVEY

FINAL SURVEY

Rock slope protection

Gravel bedding

El. 754.0

El. 762.0

Slope 4½:1

Slope 4½:1

Existing ground surface

El. 753.0

El. 762.0

Elev. 744.90

Sta. 17+66

Sta. 17+74

Sta. 17+79

Sta. 17+86

FD. 39

FD. 41

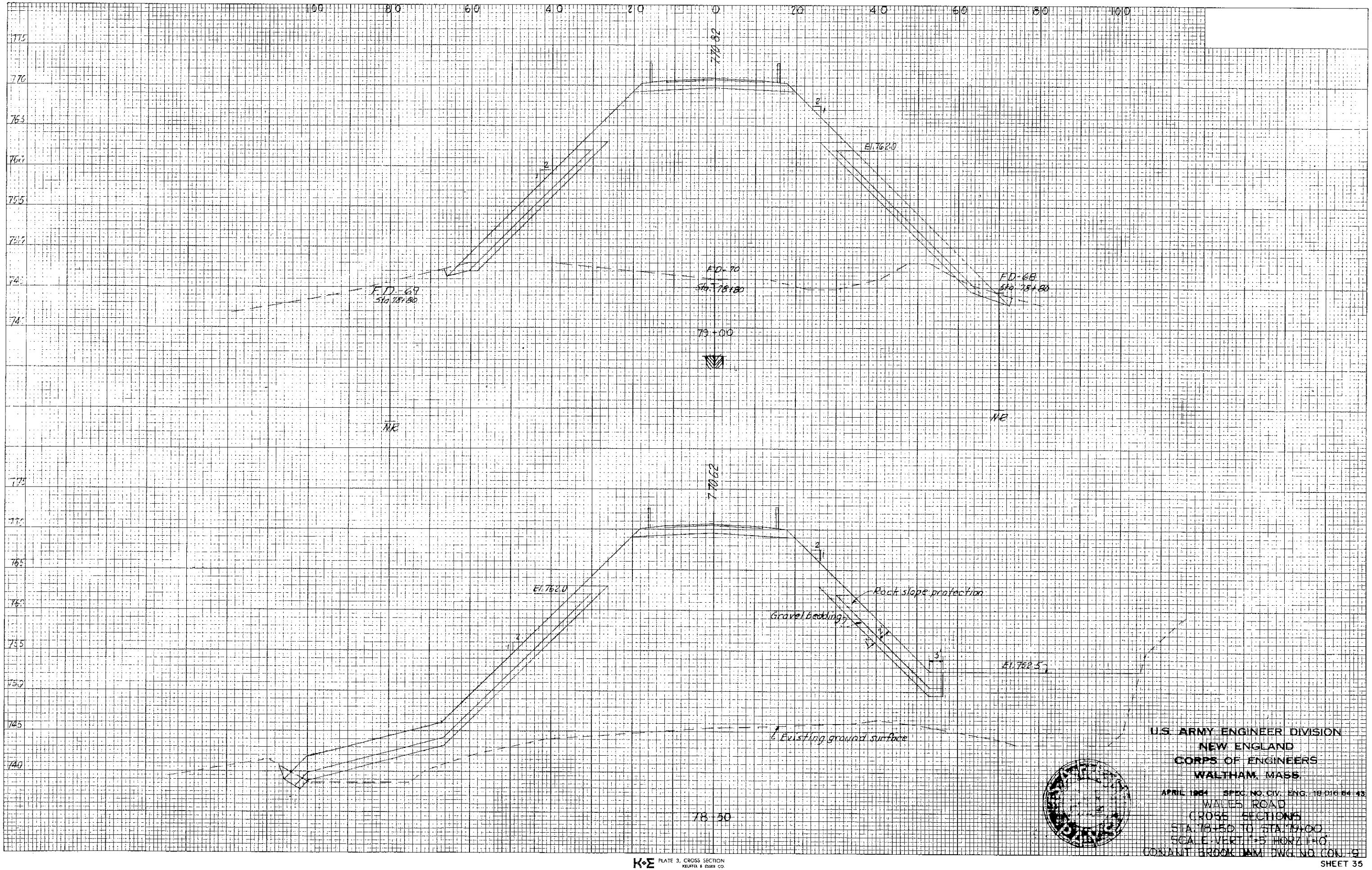
FD. 60

18+00

17+50

0 20 40 60 80 100

740 745 750 755 760 765 770 775



FINAL
AS BUILT

ORIGINAL SURVEY
NOTE BOOK
NO.

78-50

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APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 78+50 TO STA. 79+00
SCALE: VERT. 1"=5' HORZ. 1"=0'
CONANT BROOK DAM DWG. NO. CON. 9

SHEET 35

K&E PLATE 3, CROSS SECTION
KEUFFEL & ESSER CO.

80 30 20 10 0 10 20 30 40

80+50

772.22

772.56

80+00

772.50

79+50

E1762.0

Rock slope protection

Gravel bedding

Stripping

Existing ground surface

E1762.0

Rock slope protection

Gravel bedding

Stripping

FINAL SURVEY
SURVEYED
PLOTTED
TRACED
NOTE BOOK
AREAS
AREAS CHECKED
NO.
BY
DATE

ORIGINAL SURVEY
SURVEYED
PLOTTED
TRACED
NOTE BOOK
AREAS
AREAS CHECKED
NO.
BY
DATE

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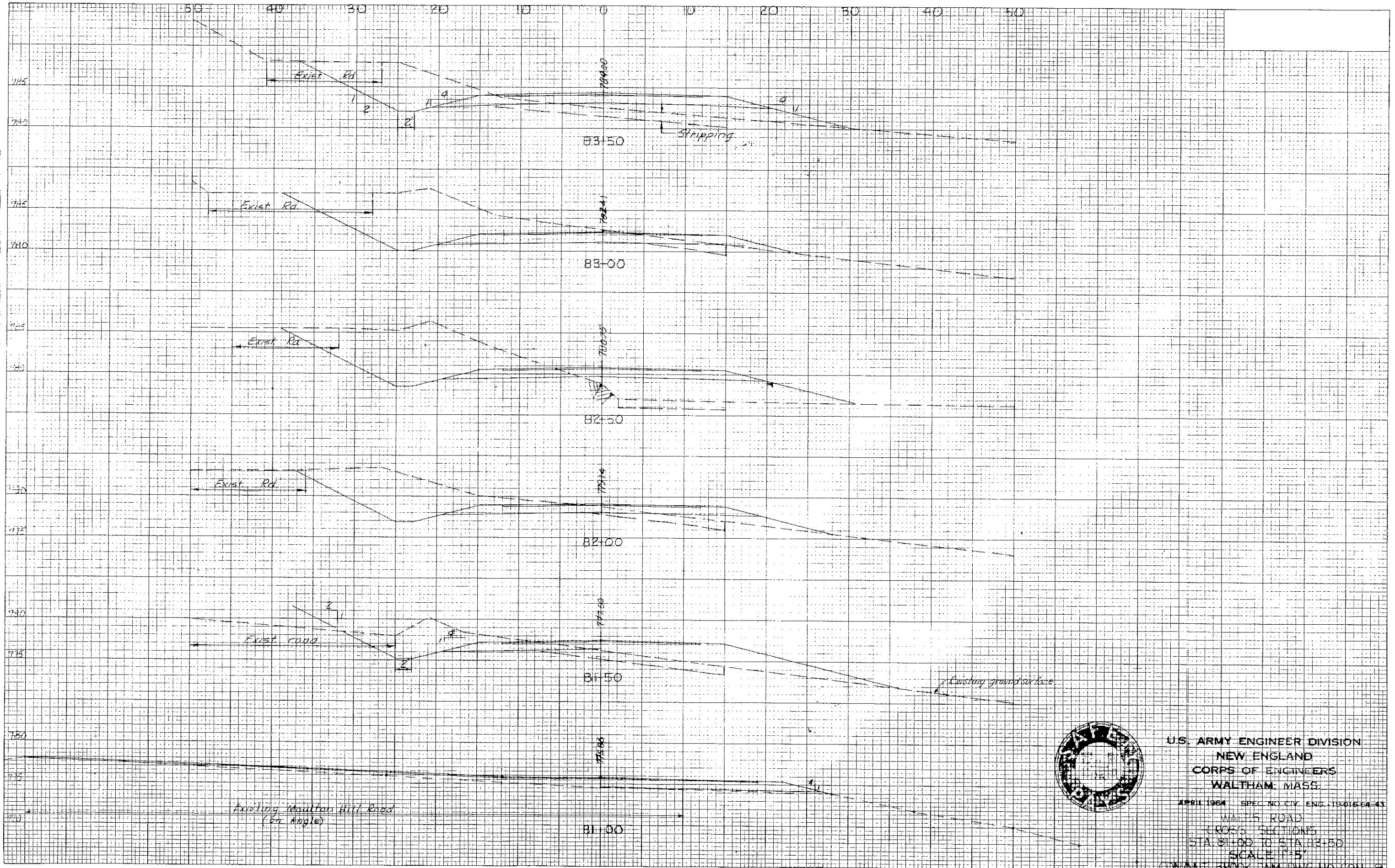
APRIL 1964 SPEC. NO. CIV. ENG. - 19-018-64-45

WALES ROAD
CROSS SECTIONS
STA 79+50 TO STA 80+50
SCALE 1"=5'

CONANT BROOK DAM DWG. NO. CON - 9

SHEET 36

K+E PLATE 3. CROSS SECTION KEUFFEL & ESSER CO.



FINAL SURVEY
NOTE BOOK
NO.

ORIGINAL SURVEY
NOTE BOOK
SURVEYED
PLOTTED
TRACED
CHECKED
APPROVED

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
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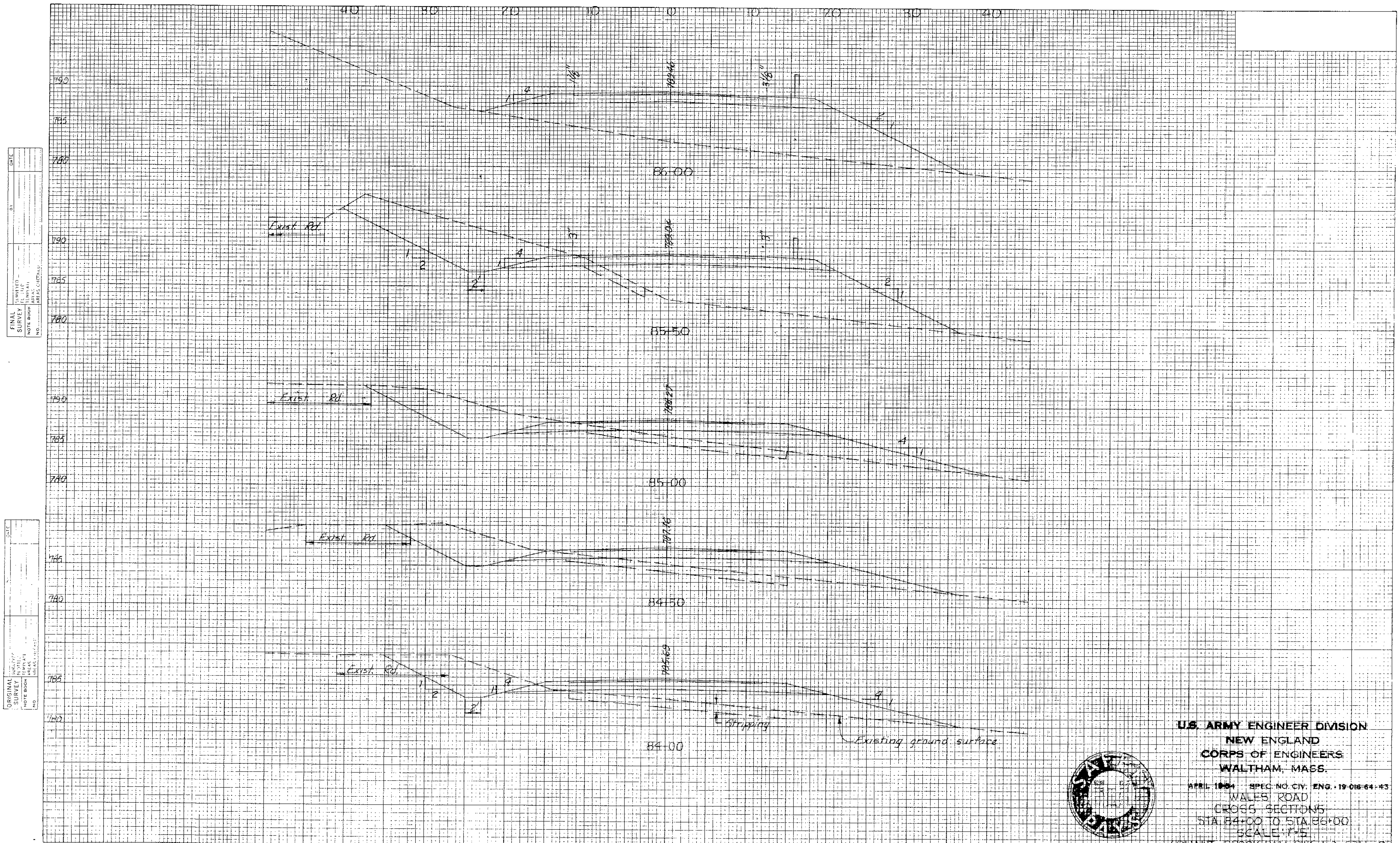
APRIL 1964 SPEC. NO. CIV. ENG. 10-016-64-43

WALTER ROAD
CROSS SECTIONS
STA. B1+00 TO STA. B3+50
SCALE 1"=5'

CONANT BROOK DAM DWG NO. CON-9

SHEET 37

K+E PLATE 3, CROSS SECTION
KEUFFEL & ESSER CO.



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APRIL 1964 SPEC NO. CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA 84+00 TO STA 86+00
SCALE 1"=5'
CONANT BROOK DAM DWG NO. CON-9
SHEET 38

K&E PLATE 3, CROSS SECTION KEUFFEL & ESSER CO.

40 30 20 10 0 10 20 30 40

88+50

88+00

87+50

87+00

86+50

Existing ground surface

Stripping

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APRIL 1964 SPEC. NO. OV. ENG. 18-018-64-43

WALES ROAD
CROSS SECTIONS
STA. 86+50 TO STA. 88+50
SCALE 1"=5'

CONANT BROOK DAM DWG NO. CN-[illegible]

SHEET 3[illegible]

K+E PLATE 3, CROSS SECTION KEUFFEL & ESSER CO.

FINAL SURVEY — DATE — NOTE BOOK — NO.

ORIGINAL SURVEY — DATE — NOTE BOOK — NO.

40 30 20 10 0 10 20 30 40

780
785
790
795
800
805
810

6" 6" 6" 6" 6" 6"

1 on 1

2 1

Inv 791.6

86"-15 ACCMP @ 0.11

79.71 79.46 79.21

90-50

Stripping

Inv Elm?

3'x10' Sack type construction apron

90-00

El 783.6

1 2 2 1

Existing ground surface

89-50

89-00

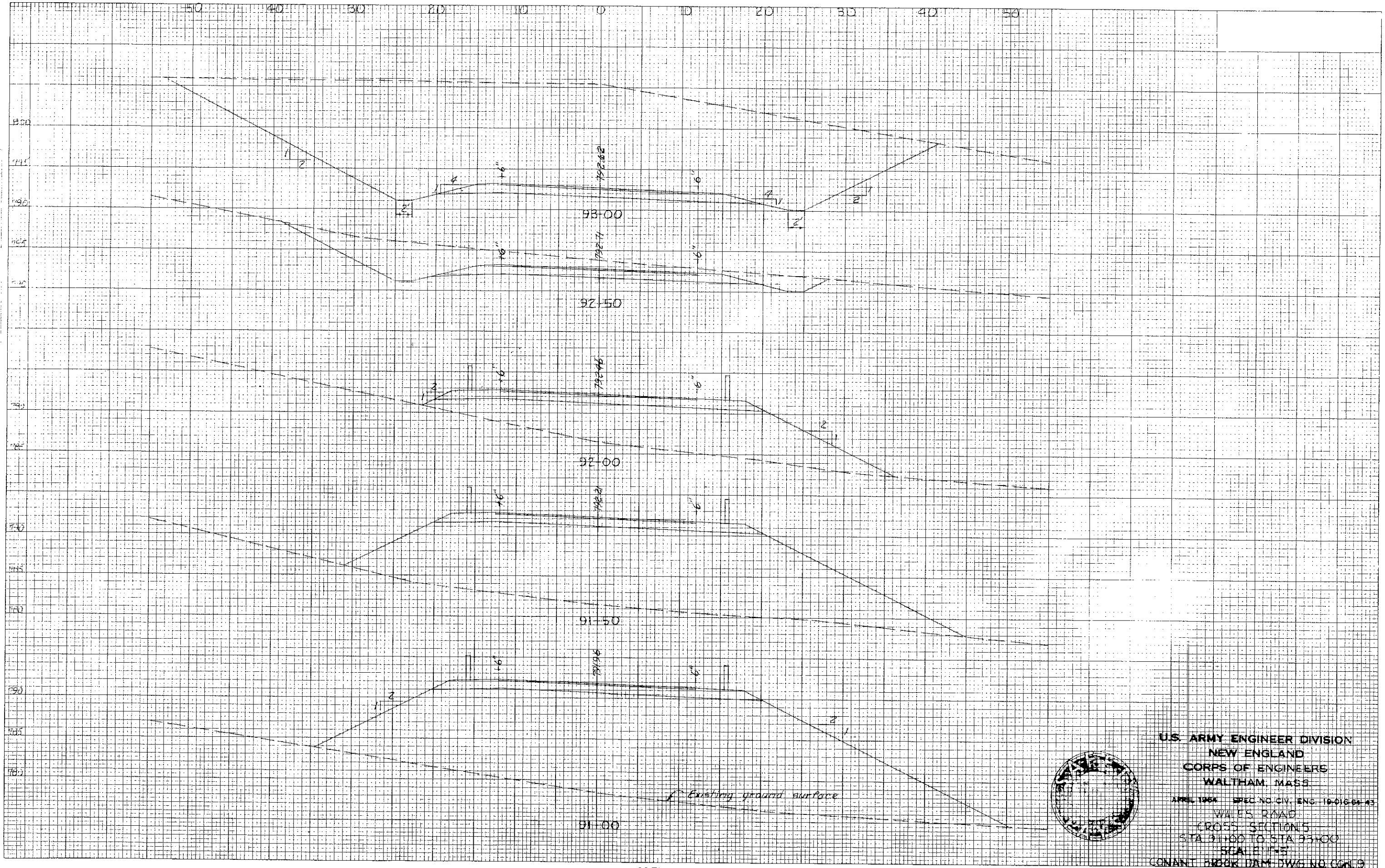
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APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-45

WALES ROAD
CROSS SECTIONS
STA 89+00 TO STA 90+50
SCALE: 1"=5'
CONANT BROOK DAM DWG NO. CON 9

SHEET 40

K&E PLATE 3, CROSS SECTION KEUFFEL & ESSER CO.



FINAL SURVEY

ORIGINAL SURVEY
SURVEYED
PLOTTED
TRACED
NOTE BOOK
CHECKED
NO.

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APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-43

WALES ROAD
CROSS SECTIONS
STA 91+00 TO STA 98+00
SCALE 1"=5'
CONANT BROOK DAM DWG NO. CON-9

SHEET 41

K+E PLATE 3, CROSS SECTION
KEUFFEL & ESSER CO.

95-00

94-50

94-00

93+50

Existing ground surface

793.96

793.71

793.46

793.21

FINAL SURVEY

ORIGINAL SURVEY

U.S. ARMY ENGINEER DIVISION
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WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-45

WALES ROAD
CROSS SECTIONS
STA. 93+50 TO STA. 95+00
SCALE 1"=5'
CONAINT. BROOK DAM DWG NO JON. 9

K&E PLATE 3, CROSS SECTION KEUFFEL & ESSER CO

40 30 20 10 0 10 20 30 40

98+00

Driveway

Exist Rd

97+50

Access to Wales Rd.

Exist Rd

20' Access to Wales Road
See Plan

Slope varies

Slope varies

97+00

96+50

96+00

Existing ground surface

Stripping

95+50

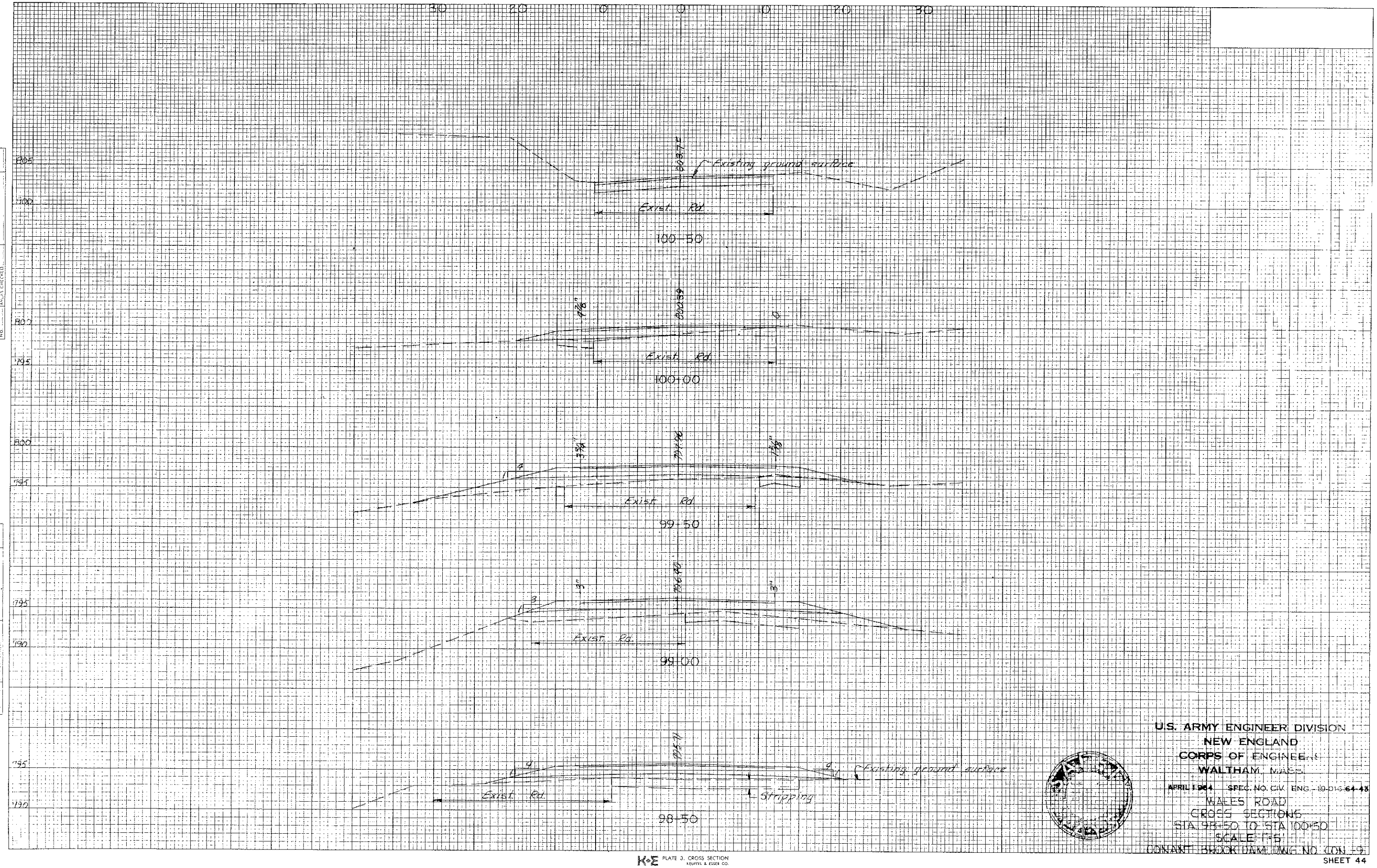
U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1954 SPEC. NO. CIV. ENG. 19-016-54-43

WALES ROAD
CROSS SECTIONS
STA. 95+50 TO STA. 98+00
SCALE H: 5' V: 5'
CONN. RIVER DAM, BWG NO. CON-2

SHEET 43

K+E PLATE 3, CROSS SECTION
KEUFFEL & ESSER CO.



FINAL SURVEY — SURVEYED — PLOTTED — NOTE BOOK — AREAS — LINES CHECKED — BY — DATE

ORIGINAL SURVEY — SURVEYED — PLOTTED — NOTE BOOK — AREAS — LINES CHECKED — BY — DATE

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
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WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. - 19-015-64-43

WALES ROAD
CROSS SECTIONS
STA. 98+50 TO STA. 100+50
SCALE 1"=5'
CONANT BROOK DAM DWG. NO. CON-19

SHEET 44

K&E PLATE 3. CROSS SECTION KEUFFEL & ESSER CO.

Existing ground surface

℄ Drop Inlet (Type C)

Elev 776.9

Inv. 772.0

15" ACCM Pipe S = .035

Inv. 771.0

6x8' Rock slope protection apron

BL + 35

℄ Road

Finished grade

3' Culvert backfill

54" ACCMP

Existing ground surface

Inv. el 795.3

5'x12' Rock Slope Protection Apron

12'x10' Rock Slope protection Apron

Inv. el 794.6

5'-0"

3'-0"

5'-2"

5'-2"

5'-2"

Strip to suitable material

5 bars, 12" o.c. with wave - Provide 3" cover

Provide hook bolts 12" o.c. (See detail, sheet 47)

1'-6"

Finished grade

End wall

See cross section for this dimension

8'-6"

SECTION A-A

62+64 (SKEW)

℄ Road

Existing ground surface

Finish grade

℄ Drop Inlet (Type C)

Elev El 818.3

12" Rock slope protection

59'-18" ACCM Pipe S = .0034

Inv el 814.0

Inv el 805.2

6" Gravel bedding

Ditch to existing grade (See detail, sheet 60)

34+80 (SKEW)

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

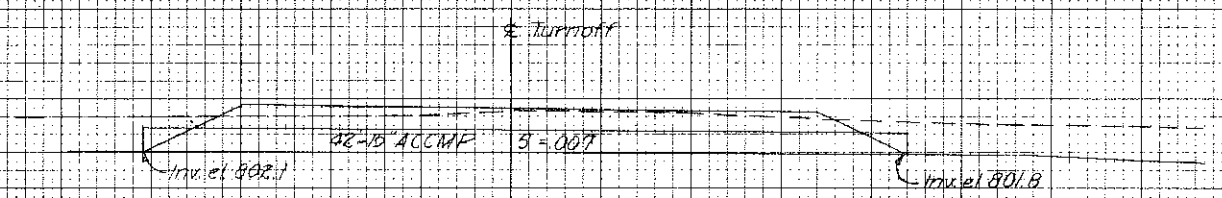
APRIL 1964 SPEC. NO. CIV. ENG. 10-016-64-43

WALES ROAD
CROSS SECTIONS
STA. 34+80 STA. 62+64 STA. 81+35
SCALE: 5

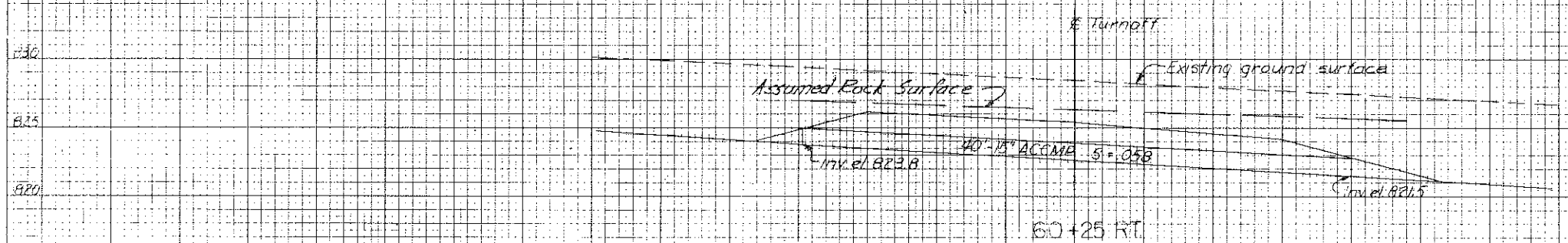
CONANT BROOK DAM DWG. NO. (CON-9)

SHEET 45

FINAL SURVEY — DATE — BY — FIELD — PLOTTED — TRACED — NOTE BOOK — CHECKED — FILE NO.



69+00-23'RT



60+25 RT

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

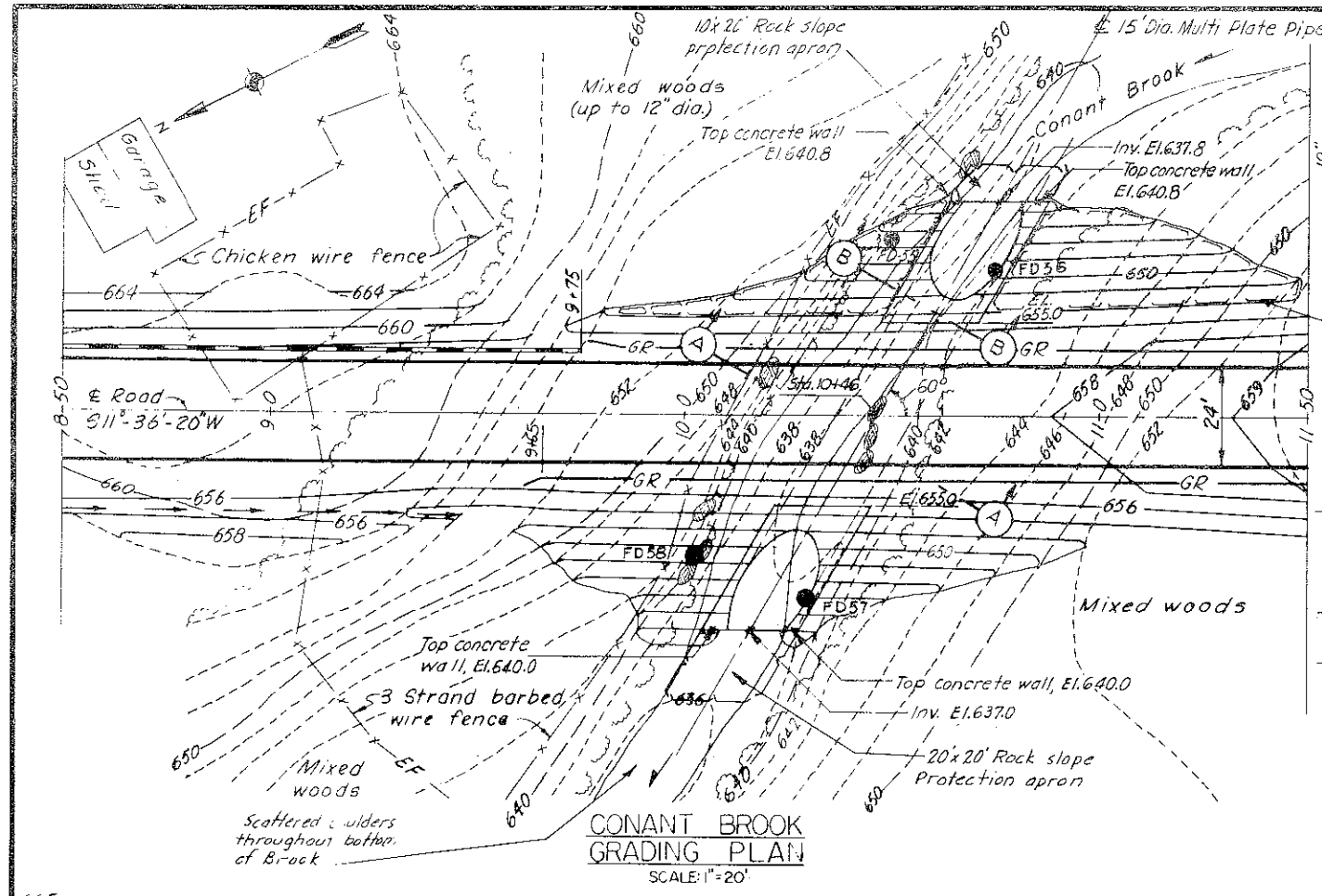
APRIL 1964 SPEC. NO. CIV. ENG.-19-018-64-43

WALES ROAD
CROSS SECTIONS
STA 60+25 RT STA 69+00-23 RT
SCALE 1"=5'
CONANT BROOK DAM DWG NO. CON-5

SHEET 46

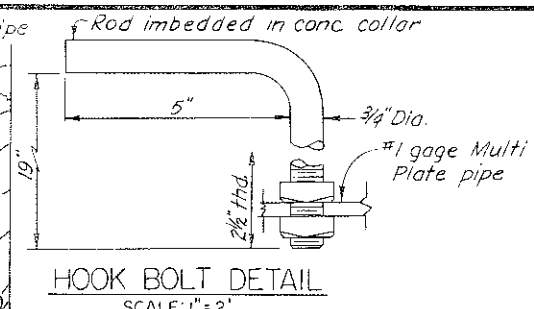
CORPS OF ENGINEERS

U. S. ARMY



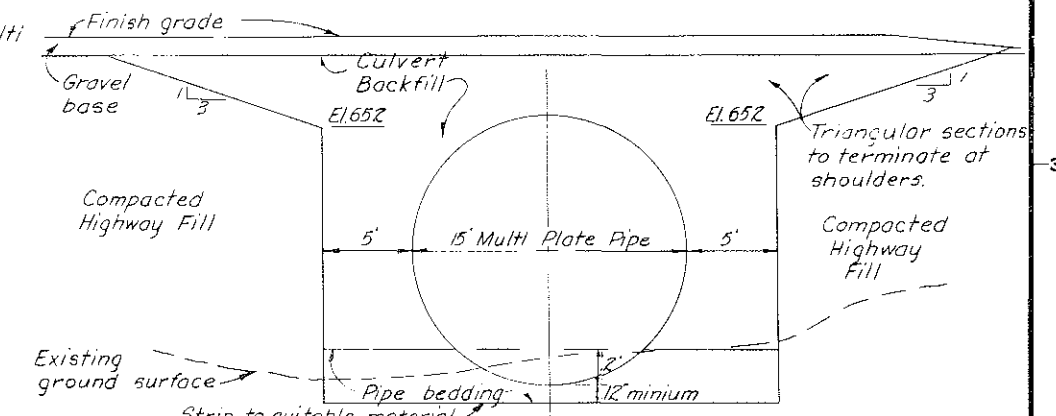
CONANT BROOK GRADING PLAN

SCALE: 1" = 20'



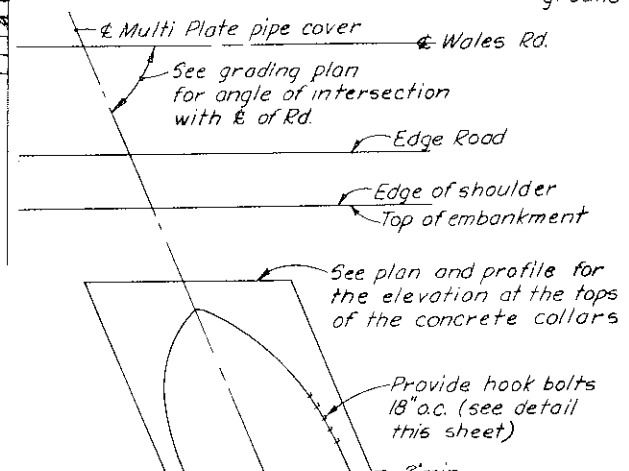
HOOK BOLT DETAIL

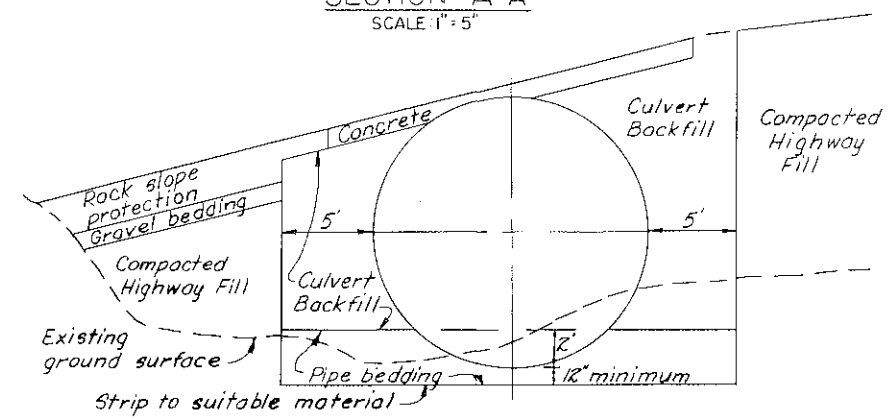
SCALE: 1" = 2'



SECTION A-A

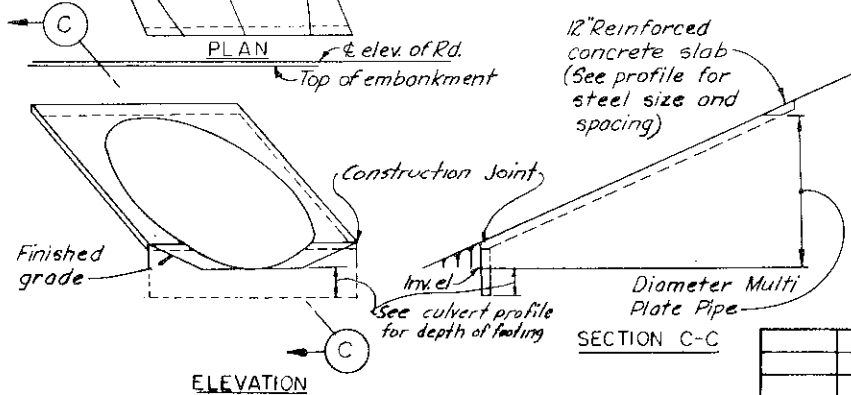
SCALE: 1" = 5'





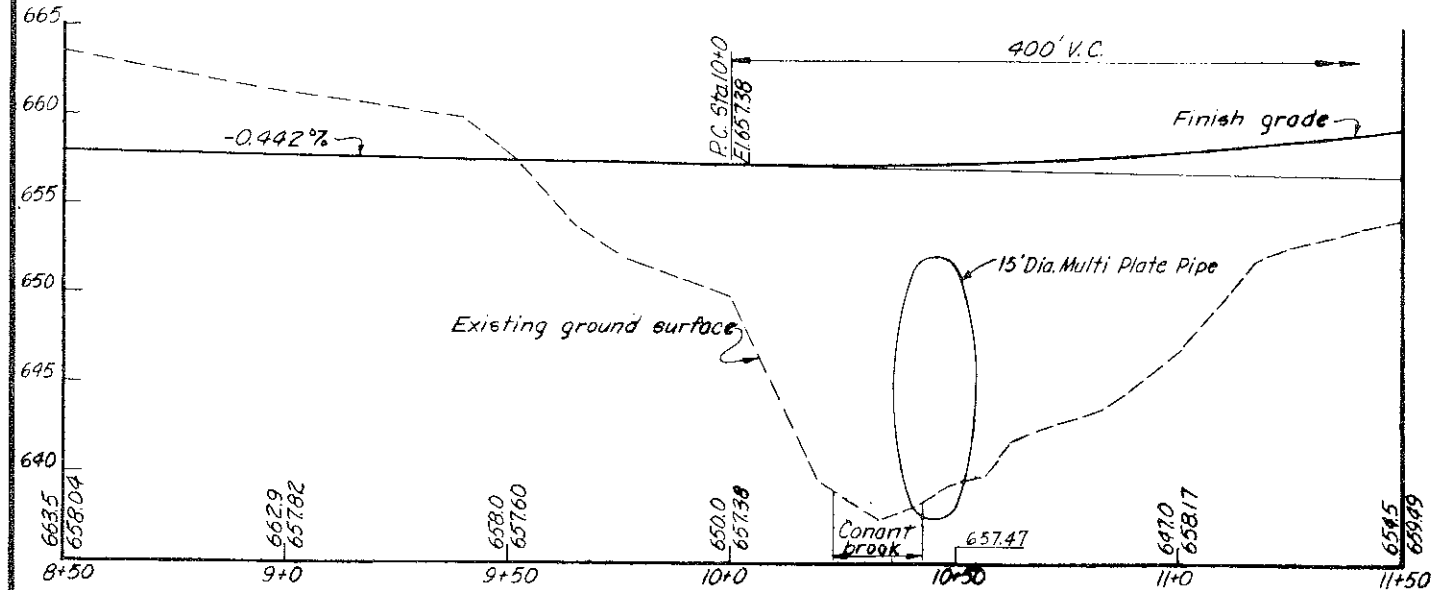
SECTION B-B

SCALE: 1" = 5'



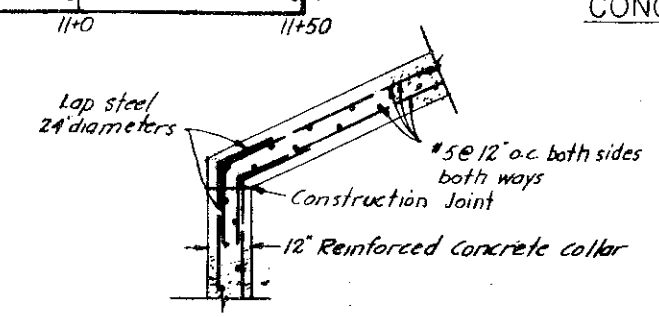
TYPICAL LAYOUT OF REINFORCED CONCRETE COLLARS

SCALE: 1" = 10'



PROFILE ALONG ℄ OF ROAD

SCALE: HORZ. 1" = 20' VERT. 1" = 5'



CONSTRUCTION JOINT

GRAPHIC SCALES

1" = 2' 0 2' 4'

1" = 5' 0 5' 10'

1" = 10' 0 10' 20'

1" = 20' 0 20' 40'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.Mc L. | DR. BY D.L.W. | CK. BY

SUBMITTED

CHIEF, OPERATIONS BRANCH

REVIEWED

CHIEF, HIGHWAY LOCATION SECTION

REVIEWED

CHIEF, DESIGN BRANCH

APPROVED

CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL

CONANT BROOK DAM

HIGHWAY RELOCATIONS AND ACCESS ROAD

WALES ROAD

CULVERT CROSSING - CONANT BROOK

PLAN AND SECTIONS

CHICOPEE RIVER MASSACHUSETTS

APPROVED DATE APRIL 1964

SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-64-43

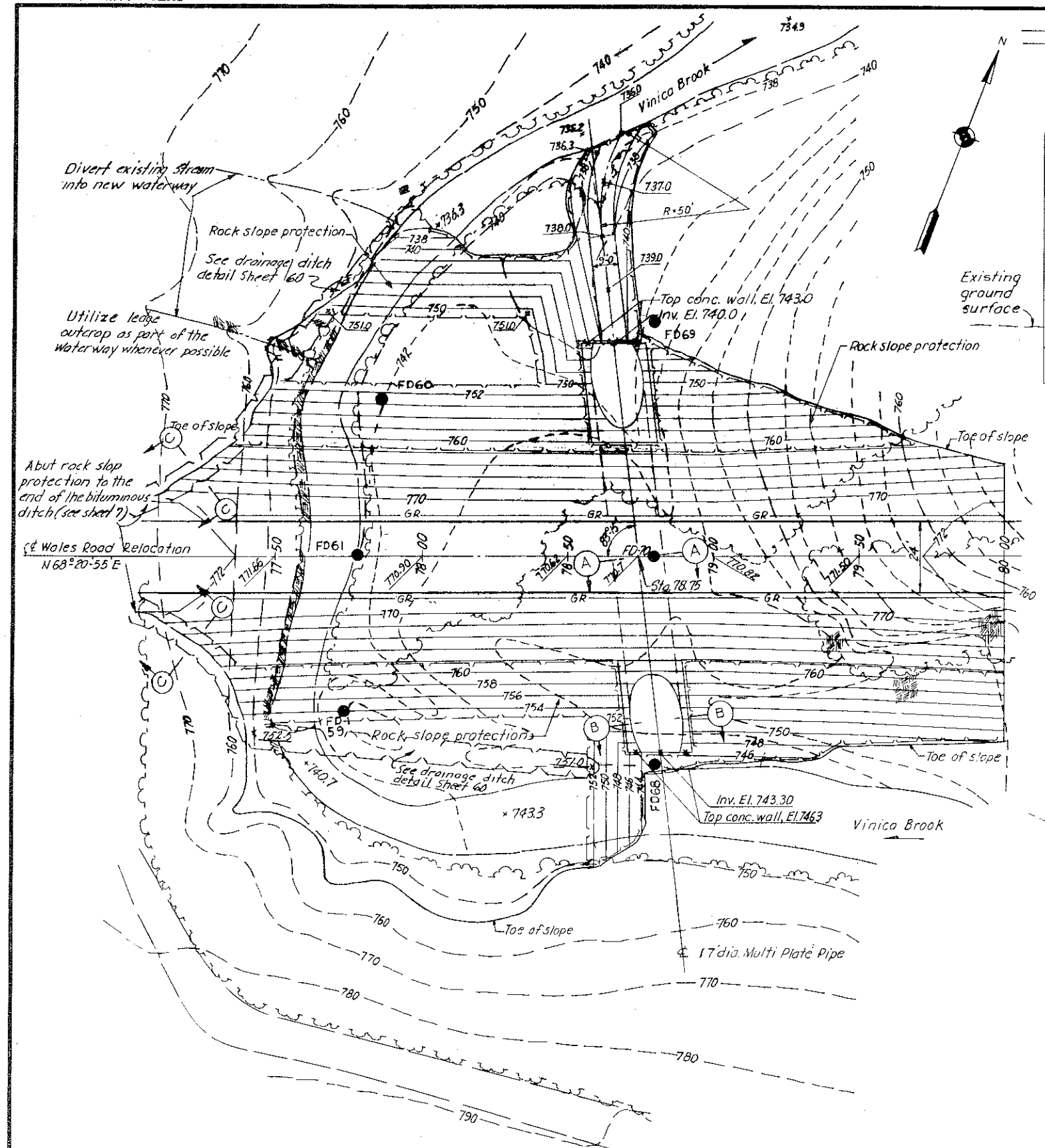
DRAWING NUMBER

CON-9

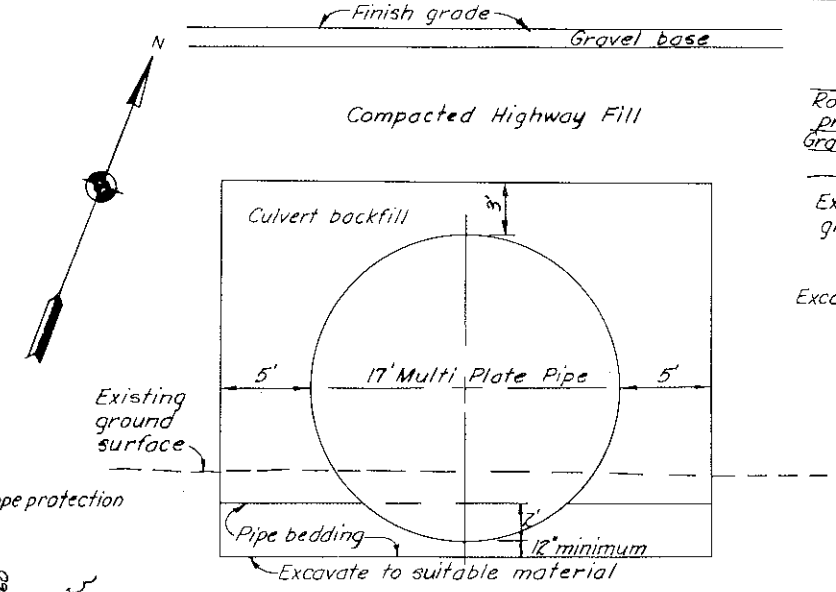
SHEET 47

CORPS OF ENGINEERS

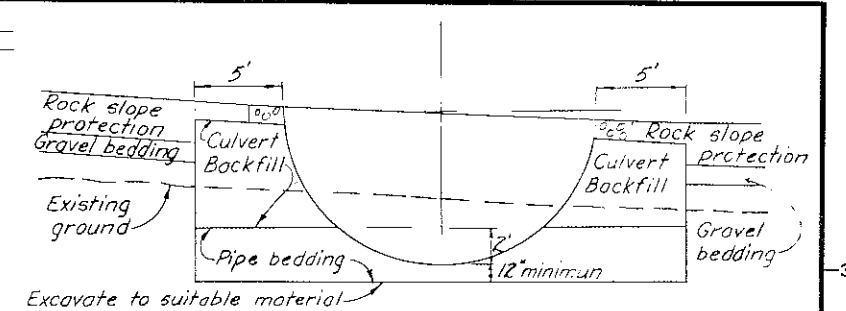
U. S. ARMY



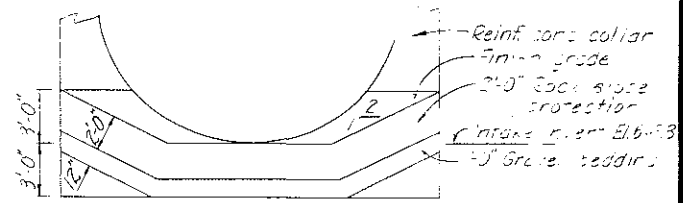
VINICA BROOK
GRADING PLAN
SCALE: 1" = 20'



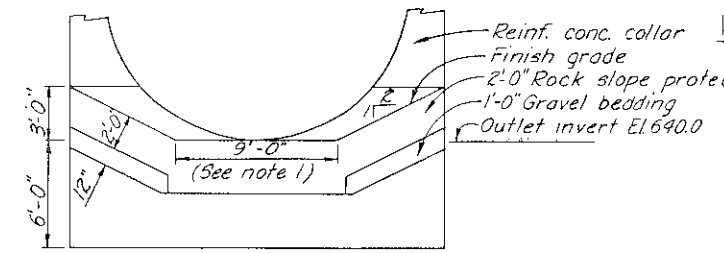
SECTION A-A
SCALE: 1" = 5'



SECTION B-B
SCALE: 1" = 5'



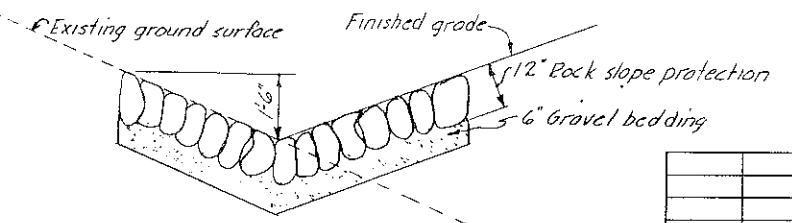
SECTION AT INTAKE END OF
17' DIA. MULTI - PLATE CULVERT
SCALE: 1" = 5'



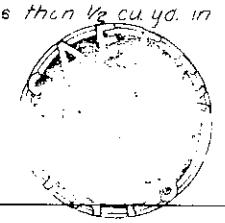
SECTION AT OUTLET END OF
17' DIA MULTI - PLATE CULVERT
SCALE: 1" = 5'

NOTES

1. Stones, in this area where the 3 ft. thickness is shown, shall not be less than ½ cu. yd. in size.



SECTION C-C
NOT TO SCALE



GRAPHIC SCALES

1" = 5' 5' 0 10'

1" = 20' 20' 0 20' 40'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.McL.	D.L.W.	

SUBMITTED
CHIEF UTILITIES SECTION

REVIEWED
HIGHWAY LOCATION ENGR.

REVIEWED
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
CULVERT CROSSING - VINICA BROOK
PLAN AND SECTIONS
CHICOPEE RIVER MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

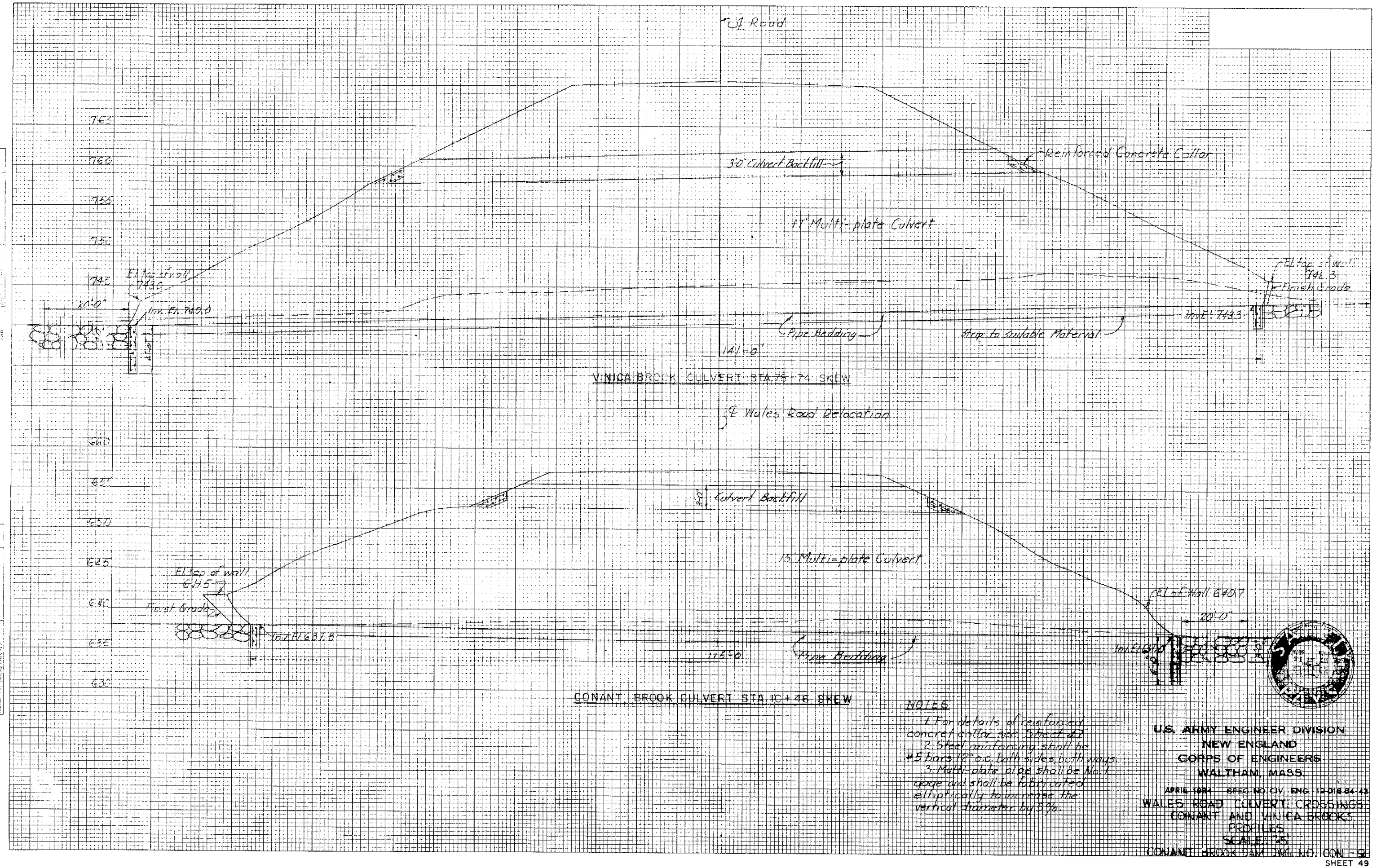
DATE APRIL 1964

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43

DRAWING NUMBER
CON-9

SHEET 48

ORIGINAL SURVEY
SURVEYED
PLOTTED
TEMPLATE
APPR.
NOTE BOOK
NO.



NOTES

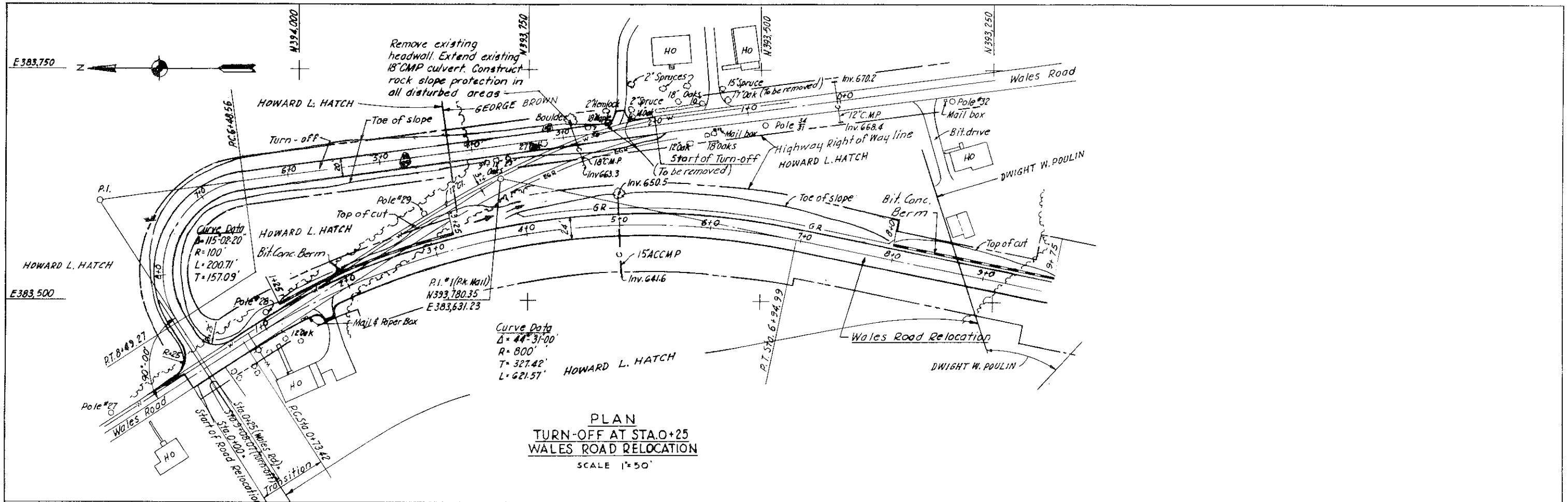
1. For details of reinforced concrete collar see Sheet 47.
2. Steel reinforcing shall be #5 bars 12" o.c. both sides both ways.
3. Multi-plate gage shall be No. 1 gage and shall be fabricated elliptically to increase the vertical diameter by 5%.

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

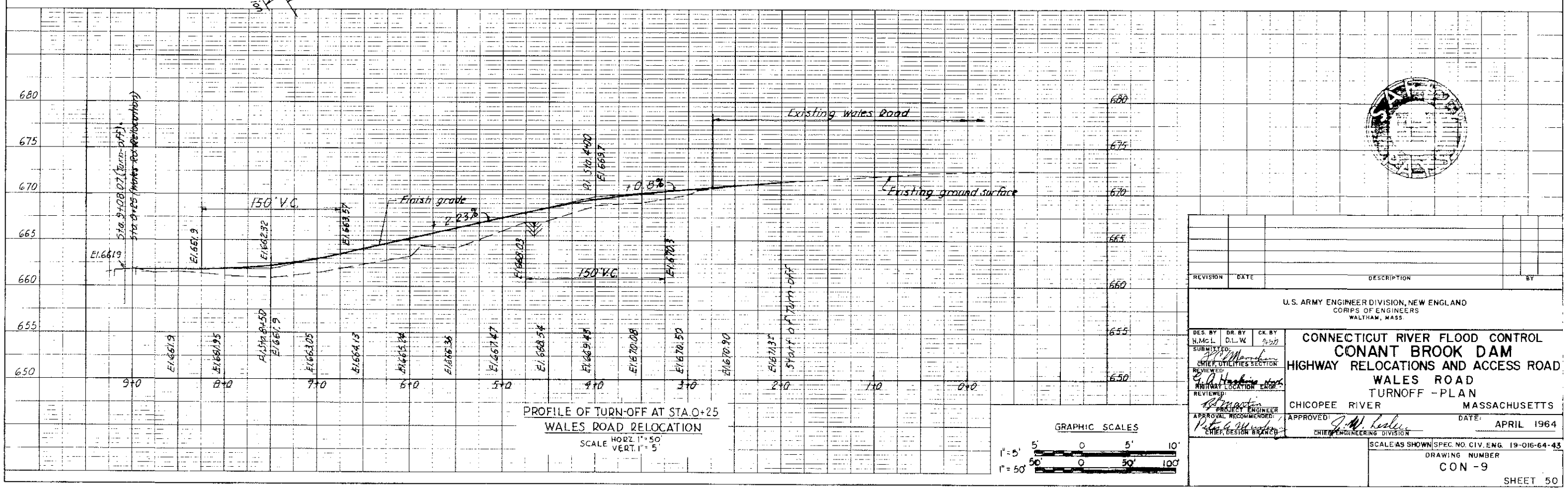
APRIL 1984 SPEC. NO. CIV. ENG. 10-018-84-43

WALES ROAD CULVERT CROSSINGS
CONANT AND VINICA BROOKS
PROFILES
SCALE: 1"=5'

CONANT BROOK DAM DWG. NO. CON. 9



PLAN
TURN-OFF AT STA. 0+25
WALES ROAD RELOCATION
SCALE 1"=50'



PROFILE OF TURN-OFF AT STA. 0+25
WALES ROAD RELOCATION
SCALE HORZ. 1"=50'
VERT. 1"=5'

GRAPHIC SCALES
1"=5' 5' 0 5' 10'
1"=50' 50' 0 50' 100'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.McL.	D.L.W.	

SUBMITTED: CHIEF, UTILITIES SECTION
REVIEWED: HIGHWAY LOCATION ENGR.
REVIEWED: PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION
DATE: APRIL 1964

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
WALES ROAD
TURNOFF - PLAN
CHICOPEE RIVER MASSACHUSETTS

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON-9
SHEET 50

PLAN — SURVEYED, PLOTTED, NOTE BOOK, ALIGNMENT CHECKED, LEVELS CHECKED, NO. —, BY

PROFILE — NOTE BOOK, NO.

US ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

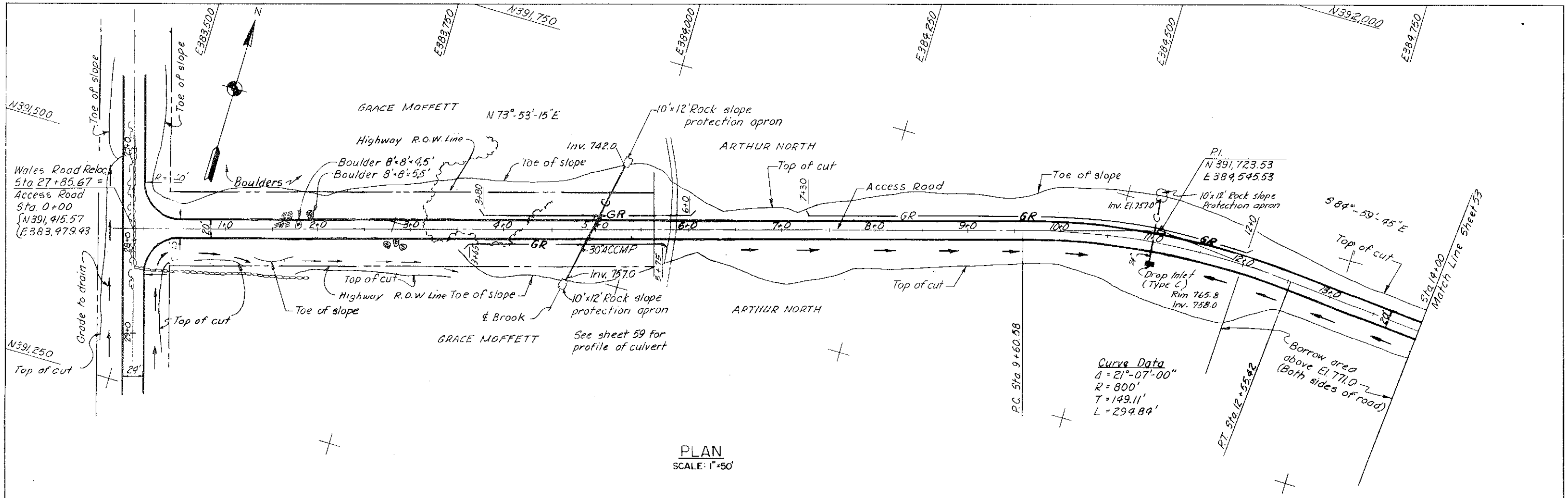
APRIL 1984 - REC NO CW ENG. 3908-84-43

WALES ROAD
TURNOFF CROSS SECTIONS
STA 2+00 TO STA 8+50
SCALE 1"=5'

OWNER: BROOK RUN, MG NO (ON) 9

SHEET 51

PLATE 3, CROSS SECTION
KEUFFEL & ESSER CO.



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

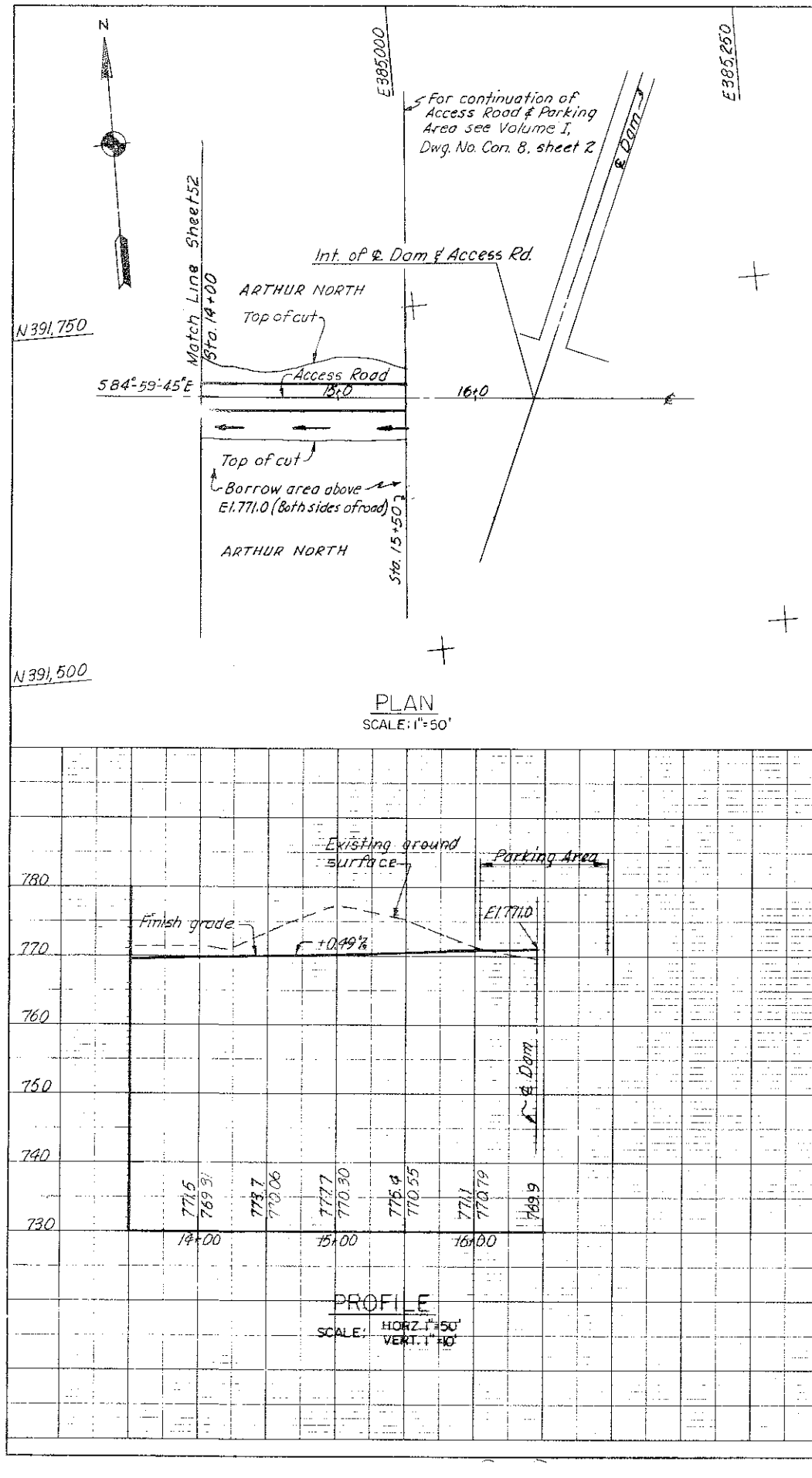
DES. BY	DR. BY	CK. BY
H. Mc L.	D.L.W.	J.H.P.

SUBMITTED: CHIEF, UTILITIES SECTION
REVIEWED: CHIEF, HIGHWAY LOCATION BRANCH
REVIEWED: PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
ACCESS ROAD
PLAN AND PROFILE NO. 1
CHICOPEE RIVER MASSACHUSETTS

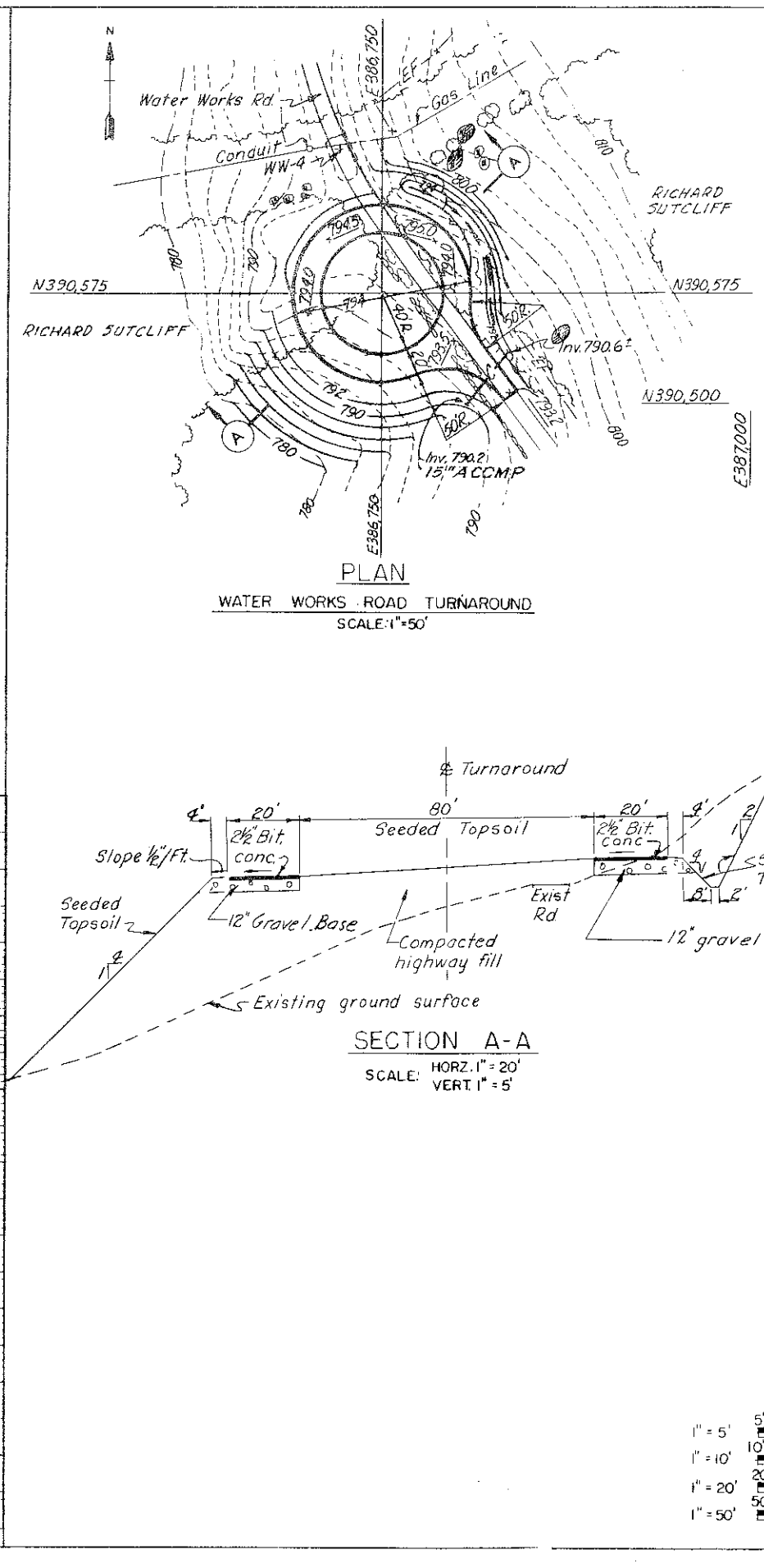
DATE APRIL 1964

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON-9
SHEET 52

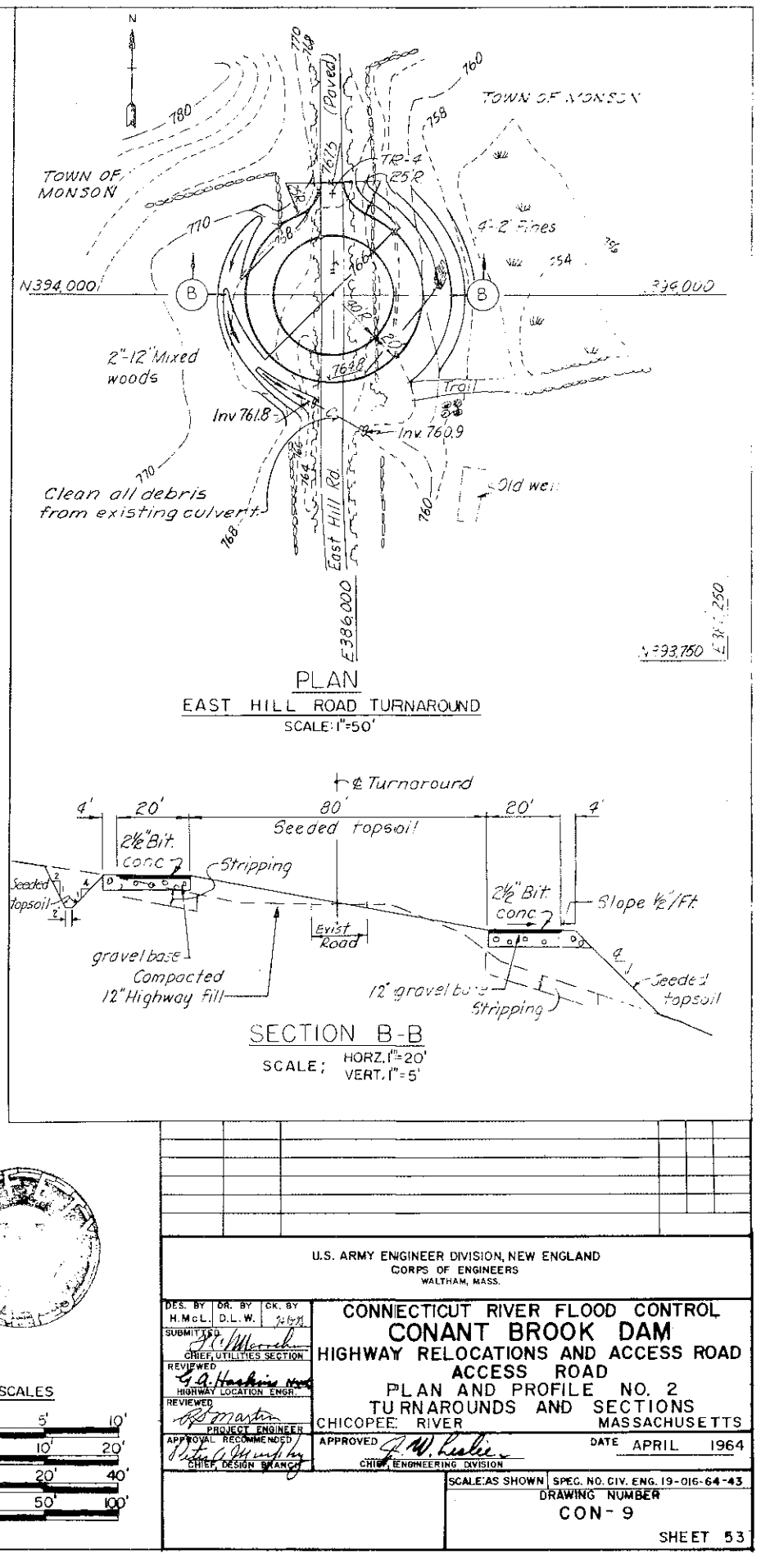


PLAN
SCALE: 1"=50'

PROFILE
SCALE: HORZ. 1"=50'
VERT. 1"=10'



PLAN
WATER WORKS ROAD TURNAROUND
SCALE: 1"=50'



PLAN
EAST HILL ROAD TURNAROUND
SCALE: 1"=50'

SECTION A-A
SCALE: HORZ. 1" = 20'
VERT. 1" = 5'

SECTION B-B
SCALE; HORZ. 1"=20'
VERT. 1"=5'

GRAPHIC SCALES

1" = 5' 5' 0 5' 10'
1" = 10' 10' 0 10' 20'
1" = 20' 20' 0 20' 40'
1" = 50' 50' 0 50' 100'

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.McL.	D.L.W.	

SUBMITTED: CHIEF, UTILITIES SECTION
REVIEWED: HIGHWAY LOCATION ENGR.
REVIEWED: PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
ACCESS ROAD
PLAN AND PROFILE NO. 2
TURNAROUNDS AND SECTIONS
CHICOPEE RIVER MASSACHUSETTS

DATE APRIL 1964

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43

DRAWING NUMBER
CON-9

SHEET 53

30 20 10 0 10 20 30 40 10 0 10 20

772.59 771.59 772.84 771.84 773.09 773.34 773.59 774.02 772.09 772.34

El. 766.67 El. 767.0 El. 767.67 El. 765.67 El. 764.67

1-50 1+00 0+50 (along ℄ Wales Rd relocation) 0+00 = Wales Road Relocation Sta 27+86.67 2-00 2+50 3+00 3+50 4+00 4-50

4" 20' 4" 2" Bit. conc. 1½" F.L. ½" F.L. ½" F.L. ½" F.L.

Compacted Fill Stripping 12" Rolled gravel base Stripping Existing ground surface Existing ground surface

ORIGINAL SURVEY — DATE — BY — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — NOTE BOOK — NO.

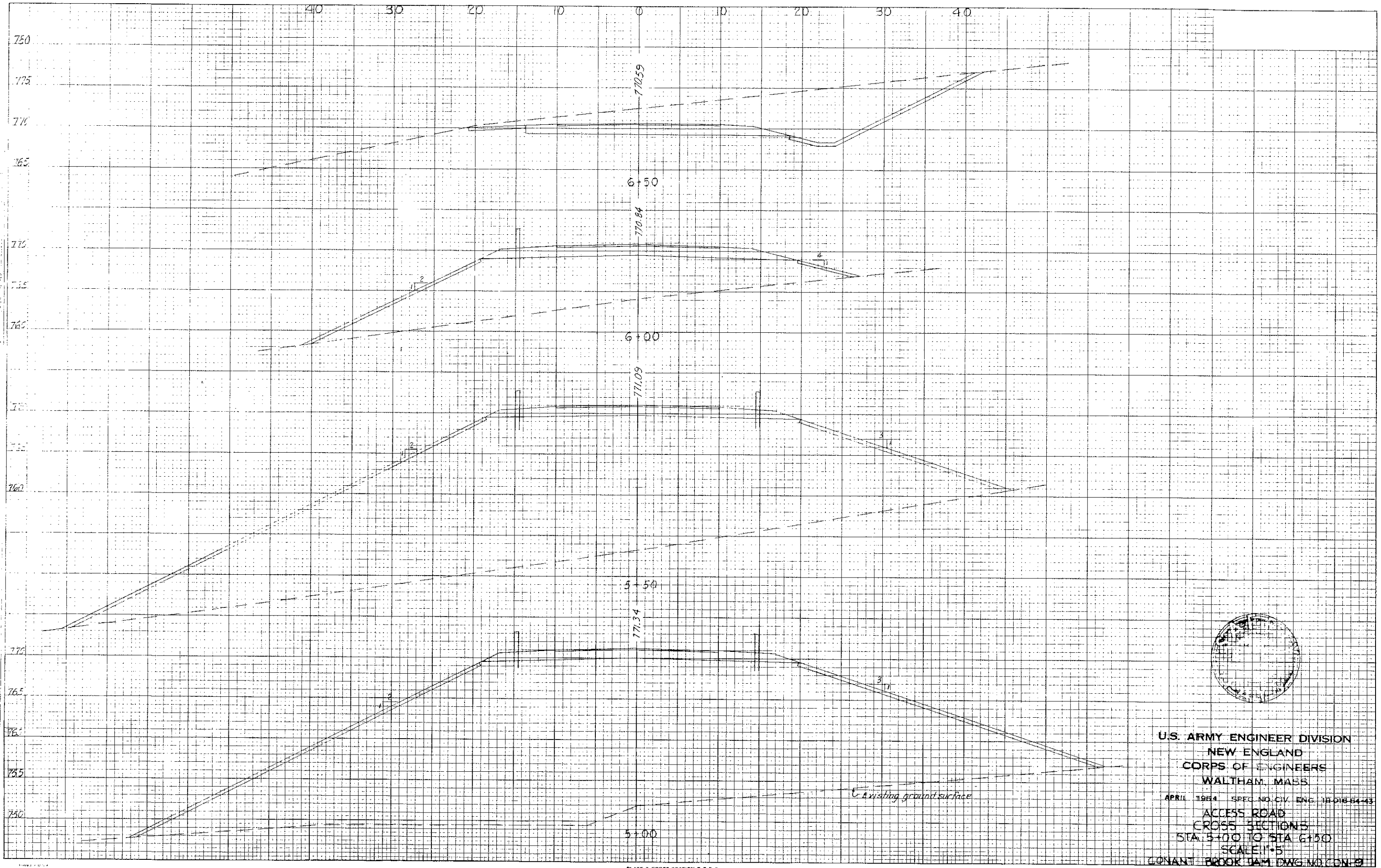
FINAL SURVEY — DATE — BY — SURVEYED — PLOTTED — TEMPLATE — AREAS — AREAS CHECKED — NOTE BOOK — NO.

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. - 19-016-64-43

ACCESS ROAD
CROSS SECTIONS
STA. 0+00 TO STA. 4+50
SCALE 1"-5'
CONANT BROOK DAM DWG NO. CON-9
SHEET 54

PLATE 3 CROSS SECTION B.P.W. STANDARD



ORIGINAL SURVEY — SURVEYED / PLOTTED / TEMPLATE / AREAS / CHECKED — NO. — DATE

PLATE 3 CROSS SECTION B P N STANDARD

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. 18-018-64-43

ACCESS ROAD
CROSS SECTIONS
STA. 5+00 TO STA. 6+50
SCALE: 1"=5'
CONANT BROOK DAM DWG. NO. CON-9

FINAL SURVEY	SURVEYED PLOTTED TEMPLATE AREAS AREAS CHECKED	BY	DATE
NOTE BOOK			
NO.			

ORIGINAL SURVEY	COMPILED PLOTTED TEMPLATE AREAS AREAS CHECKED	BY	DATE
NOTE BOOK			
NO.			

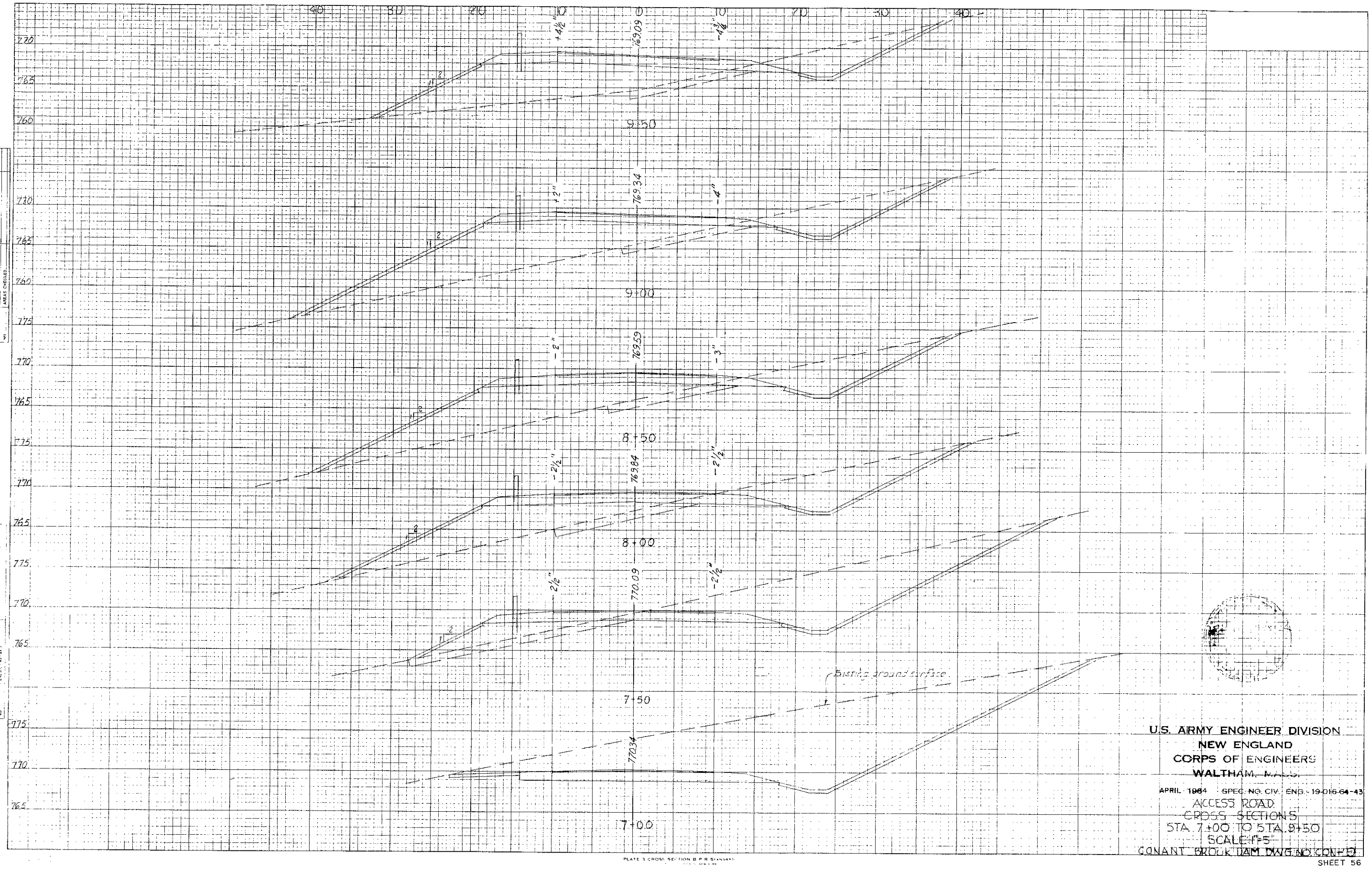


PLATE 3 CROSS SECTION B.P.R. STANDARD

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG.-19-016-64-43

ACCESS ROAD
CROSS SECTIONS
STA. 7+00 TO STA. 9+50
SCALE 1"=5'
CONANT BROOK DAM DWG NO CONP-5

SHEET 56

FINAL SURVEY
SURVEYED
PLOTTED
NOTE BOOK
TEMPLATE
AREAS
AREAS CHECKED
DATE
NO.

ORIGINAL SURVEY
SURVEYED
PLOTTED
NOTE BOOK
TEMPLATE
AREAS
AREAS CHECKED
DATE
BY
NO.

40 30 20 10 0 10 20 30 40

775
770
765
760
755

1+50
768.75
+5"
-5"
1+00
768.71
+5"
-5"
11+00
768.76
+5"
-5"
10+50
768.88
+5"
-5"
10+00

Drop Inlet (Type C)
Rim: 765.15

R = 24" RCMP
S = 0.018

Stump to be omitted on this inlet

Inv. 755.80

Inv. 751.10

10'x12' Rock slope Protection Apron

Existing ground surface

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-43

ACCESS ROAD
CROSS SECTIONS
STA 10+00 TO STA 1+50
SCALE 1"=5'
CONANT BROOK DAM DWG NO. CON-9

SHEET 57

Printed in U.S.A.
On IMPERIAL Tracing Cloth

PLATE 5 CROSS SECTION U P R STANDARD
KEUFFEL & ESSER CO CHICAGO NEW YORK

FINAL SURVEY	BY	DATE
NOTE BOOK	SURVEYED	
NO.	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	

ORIGINAL SURVEY	BY	DATE
NOTE BOOK	SURVEYED	
NO.	PLOTTED	
	TEMPLATE	
	AREAS	
	AREAS CHECKED	

30 20 10 0 10 20 30

14+00

+2½" 769.81 -2½" El. 771.0

775 770 765

13+50

+1½" 769.57 -3½" El. 771.0

775 770 765

13+00

+2¾" 769.32 -4½" El. 771.0

775 770 765

12+50

+5" 769.08 -5" El. 771.0

775 770 765 760

12+00

+5" 768.87 -5" El. 771.0

775 770 765 760

Existing ground surface

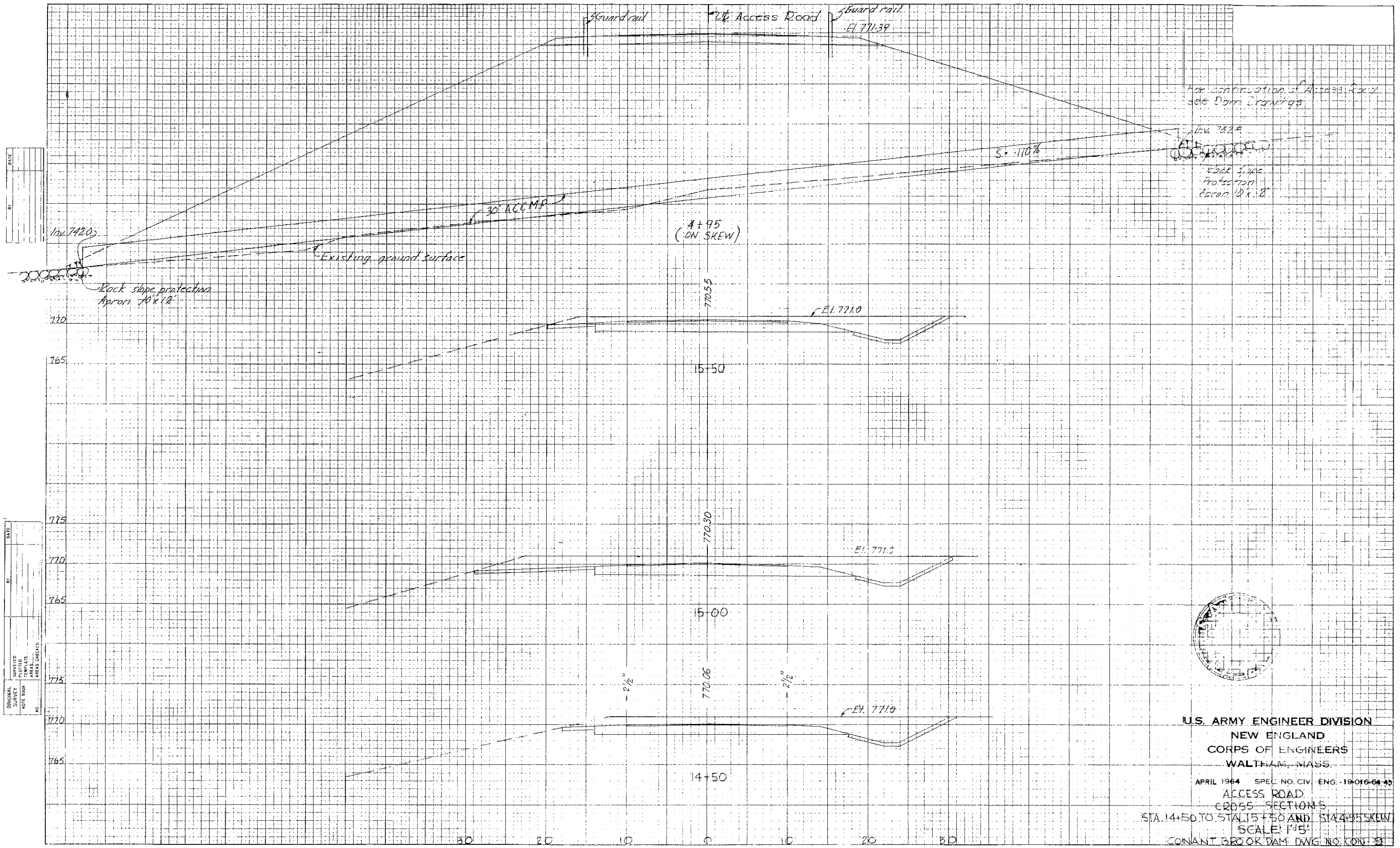
Note: All Excavation from Sta 0+00 to Sta 12+40 shall be paid for as "Unclassified Excavation-General". All excavation beyond Sta 13+00 above Elev. 771.0 shall be paid for as "Unclassified Excavation-Borrow" and all excavation below El. 771.0 shall be paid for as "Unclassified Excavation-General."

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. - 19-016-64-43

ACCESS ROAD
CROSS SECTIONS
STA 12+00 TO STA 14+00
SCALE 1" = 5'
CONANT BROOK DAM DWG NO. CON-9

SHEET 58



ORIGINAL SURVEY — DATE — BY — SURVEYED — PLOTTED — TEMPLATE — AREAS — NOTE BOOK — AREAS CHECKED — CKD

U.S. ARMY ENGINEER DIVISION
NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL 1964 SPEC. NO. CIV. ENG. 19-016-64-45

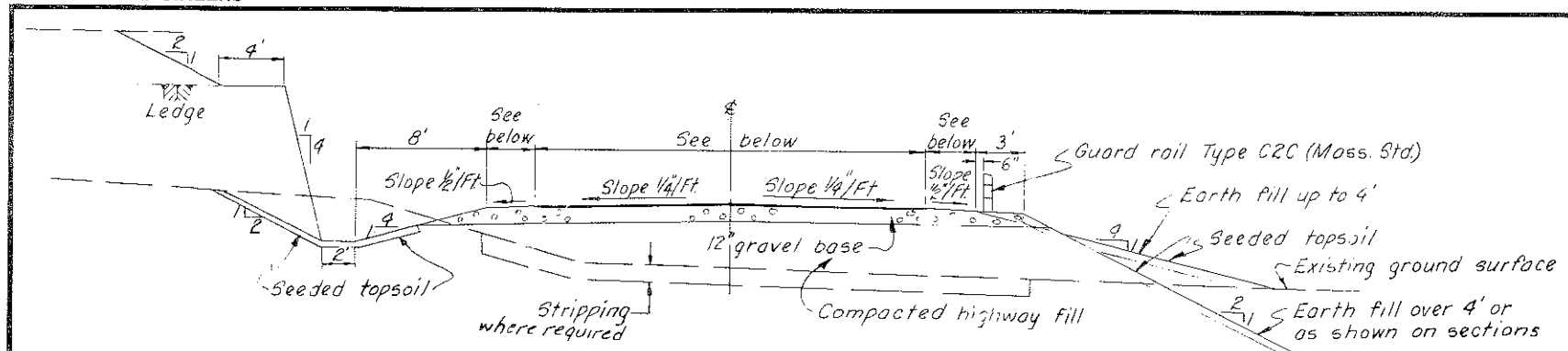
ACCESS ROAD
CROSS SECTIONS
STA. 14+50 TO STA. 15+50 AND STA. 4+95 SKEW
SCALE: 1"=5'

CONANT BROOK DAM DWG. NO. CON-51

SHEET 59

CORPS OF ENGINEERS

U. S. ARMY



TYPICAL ROAD SECTION

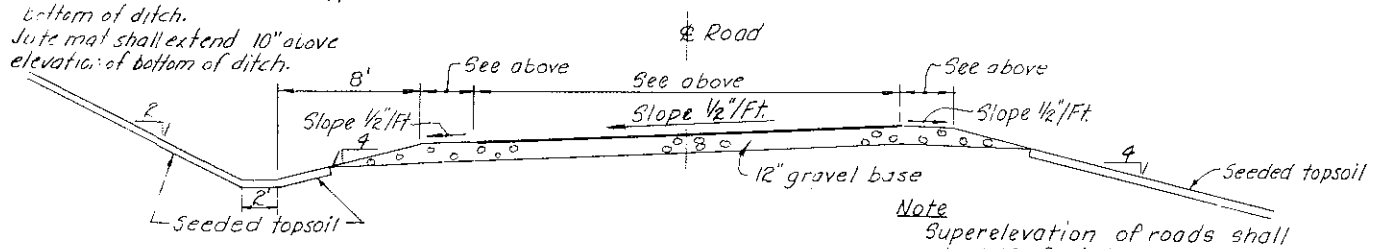
SCALE: 1"=5'

Note:

Ditch elevations shall be as determined from typical road sections except where specific elevations are indicated on the road cross section sheet.
Bituminous concrete in paved ditches shall extend 1' above elevation of bottom of ditch.
Jute mat shall extend 10" above elevation of bottom of ditch.

Wales Road Relocation } 24' wide, 3' shoulders, 2½" bit. conc. { 1¼" Surface course / 1¼" Binder course

Access Road to Dam } 20' wide, 4' shoulders, 2½" bit conc. { 1¼" Surface course / 1¼" Binder course

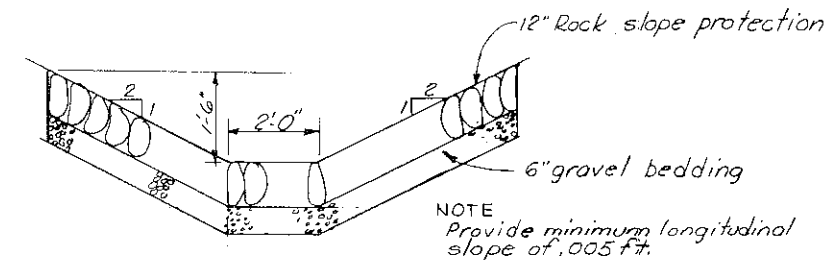


Note

Superelevation of roads shall start 150 feet before the P.C. and extend 150 feet beyond the P.T. of curves or as shown on sections.

TYPICAL SUPERELEVATED ROAD SECTION

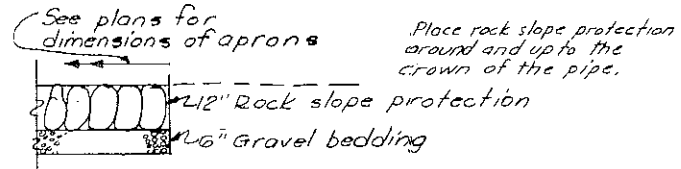
SCALE: 1"=5'



NOTE
Provide minimum longitudinal slope of .005 ft.

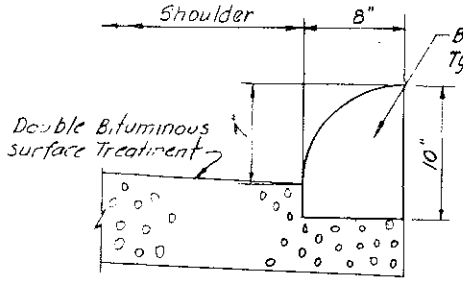
TYPICAL DRAINAGE DITCH DETAILS

NOT TO SCALE



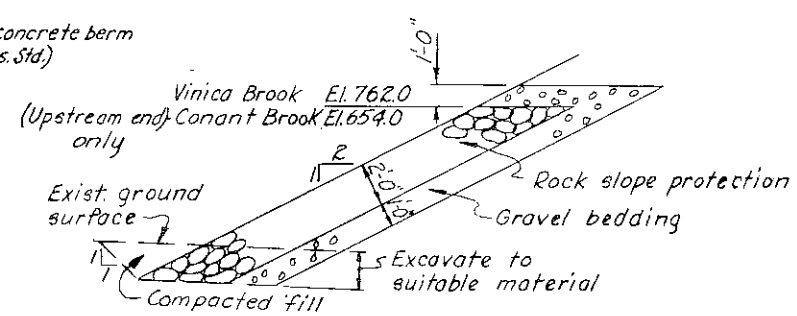
PARTIAL APRON SECTION

NOT TO SCALE



BITUMINOUS CONCRETE BERM

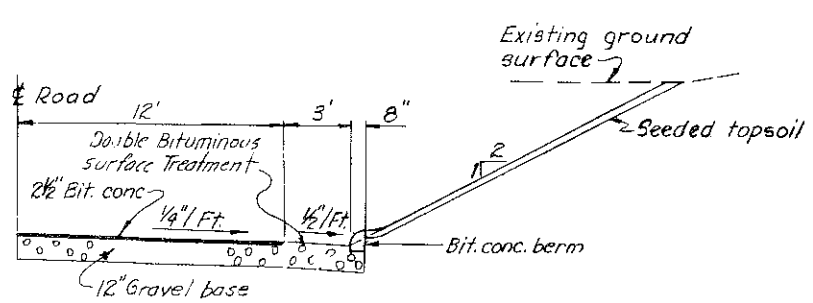
NOT TO SCALE



TYPICAL SECTION OF ROCK SLOPE PROTECTION AND GRAVEL BEDDING

NOT TO SCALE

Wales Road Relocation Left Sta. 77+35 to 79+75 } Vinica Brook
" " " Right Sta. 77+35 to 80+25 }
Left Sta. 9+80 to 11+50 } Conant Brook



TYPICAL DETAIL AT BERM

NOT TO SCALE

GRAPHIC SCALE

1"=5' 5' 0 5' 10'

NOTES

1. Construction of Turn-off at Sta 0+25, Wales Road Relocation, to be similar to that of the Access Road.
2. Construction work on Moulton Hill Road in the vicinity of Wales Road Relocation to be similar to that of Wales Road Relocation.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.Mc L. | DR. BY D.L.W. | CK. BY

SUBMITTED: Frederick C. Hamilton, Jr. CHIEF, UTILITIES SECTION

PROJECT ENGINEER: E. A. Hutchinson, HIGHWAY LOCATION SECTION

REVIEWED: Winston, CHIEF, PROJECTS BRANCH

APPROVED AND RECOMMENDED: Peter A. Collins, CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
TYPICAL ROAD SECTIONS

CHICOPEE RIVER MASSACHUSETTS

APPROVED: Gilbert M. Cuskie, CHIEF, ENGINEERING DIVISION

DATE APRIL 1964

SCALE: AS SHOWN

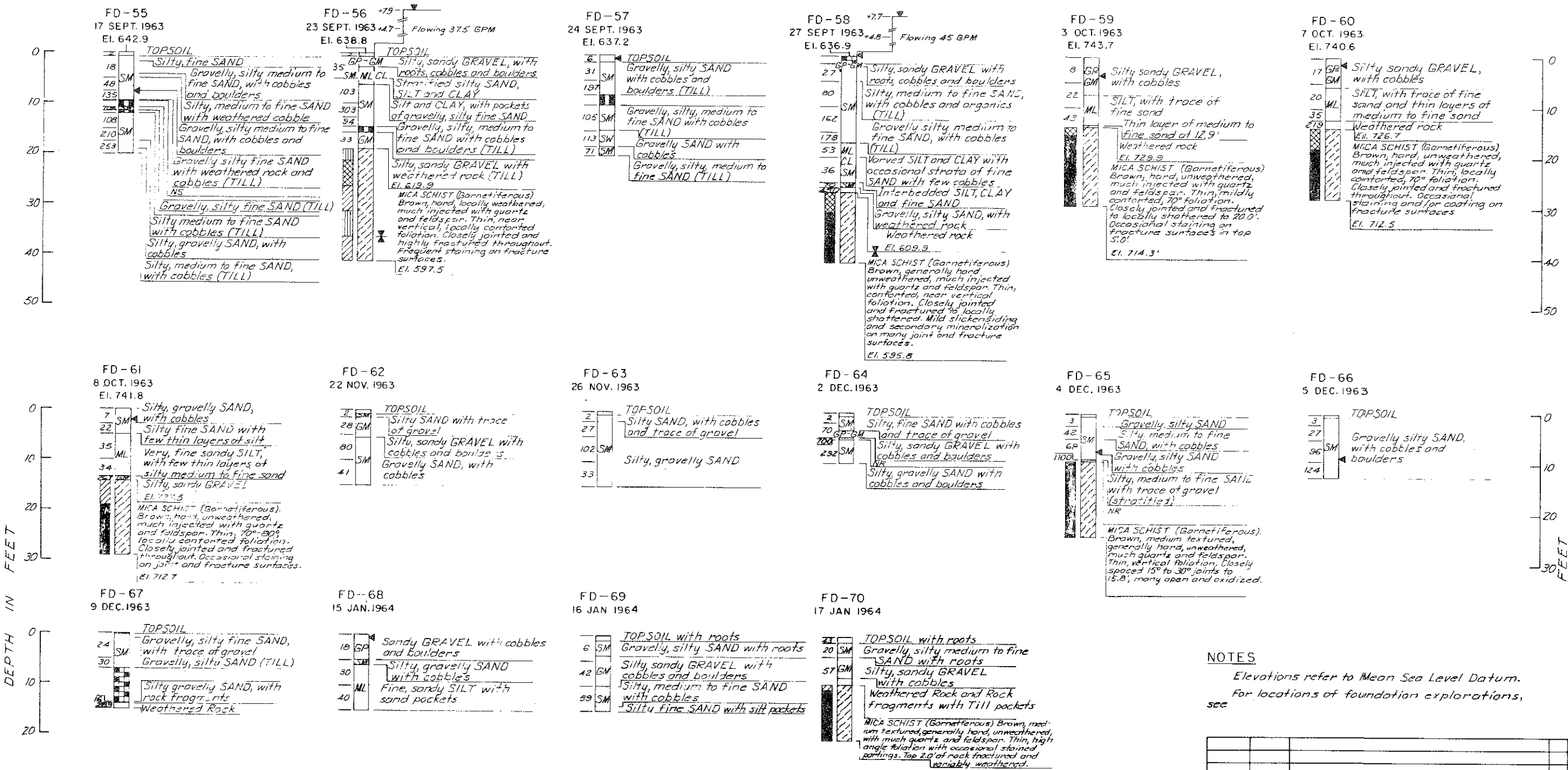
SPEC. NO. CIV. ENG. 19-016-64-43

DRAWING NUMBER
CON-9

SHEET 60

CORPS OF ENGINEERS

U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum.

For locations of foundation explorations, see

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY L.H.I. | CK. BY

SUBMITTED
CHIEF, ENGINEERING SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION

APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
FOUNDATION EXPLORATIONS NO. 1
CHICOPEE RIVER MASSACHUSETTS

DATE APRIL 1964

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-64-43

DRAWING NUMBER
CON-9

SHEET 61

CORPS OF ENGINEERS

U. S. ARMY

FA – 1
30 SEPT. 1963
El. 646 ±

0
10
PT — PEAT
SM — Silty medium to fine SAND with pockets of silt and numerous cobbles

FA-2
6 DEC. 1963

TOPSOIL
SM — Silty medium to fine SAND with organics
Medium to fine, sandy organic SILT
Silty, medium to fine SAND with organics
Silty, gravelly SAND

Refusal to Auger

FT – 4
21 NOV. 1963

ML — TOPSOIL
SM — Fine, sandy SILT with cobbles, boulders, roots and trace of gravel
Silty, sandy GRAVEL with cobbles and boulders
Silty, gravelly medium to fine SAND with cobbles and boulders

Pit Dimensions 5'x2.5'x6'

Cobbles and Boulders
4" – 6" = 41
6" – 18" = 31
Over 18" = 0

FT-5
21 NOV 1963

SM — TOPSOIL
Silty, medium to fine SAND with cobbles and boulders and trace of gravel
Silty, gravelly SAND with cobbles and boulders

Pit Dimensions 5'x2.5'x6'

Cobbles and Boulders
4" – 6" = 38
6" – 18" = 5
Over 18" = 0

FT-6
6 DEC. 1963

SM — TOPSOIL
Gravelly, silty fine SAND with cobbles and boulders
Silty, medium to fine SAND with trace of gravel
Rock fragments

Pit Dimensions 6'x2'x5'x4.5'

Cobbles and Boulders
4" – 6" = 9
6" – 18" = 1
Over 18" = 0

0
10
20

FTT-3
27 NOV. 1963

ML — TOPSOIL
Fine, sandy SILT, with cobbles and boulders
Silty, medium to fine SAND (stratified) with cobbles
Silty, gravelly SAND, with cobbles

Trench Dimensions 8.5'x2'x3.5'x0'

Cobbles and Boulders
4" – 6" = 21
6" – 18" = 12
Over 18" = 0

FTT-4
27 NOV 1963

SM — TOPSOIL
Silty, medium to fine SAND with cobbles and boulders and trace of gravel
Gravelly, silty SAND with cobbles

Trench Dimensions 10'x2'x2.2'

Cobbles and Boulders
4" – 6" = 18
6" – 18" = 3
Over 18" = 0

FP-1
6 DEC 1963

3/4" Pipe pushed by 1 man
3/4" Pipe pushed by 2 men
3/4" Pipe driven by 8 lb.
sledge hammer

No samples taken
Numbers on left are blows/ft.

FP-2
6 DEC 1963

3/4" Pipe pushed by 1 man
3/4" Pipe pushed by 2 men
3/4" Pipe driven by 8 lb.
sledge hammer

No samples taken
Numbers on left are blows/ft.

0
10

LEGEND FOR GRAPHIC LOGS

FD-55	Foundation Test Boring.
FA-10	Foundation Hand Auger Boring.
FT-2	Foundation Test Pit.
FTT-2	Foundation Test Trench.
FP-2	Foundation Test Probing.
2 OCT. 1963	Date exploration completed.
El. 642.1	Elevation of ground surface during time of exploration.
	Maximum artesian head
	Subsurface water level in boring at time of exploration.
	Artesian flow encountered.
SM	Group letter symbol according to Unified Soil Classification System.
NR	No recovery or unsatisfactory soils samples recovered.
NS	Not sampled. Hole advanced by Core-drilling, blasting and/or wash boring due to operational difficulty.
35	Blows per foot of penetration considered most representative for each sample drive using a 350 pound hammer with a free fall of about 18" on a standard 5 foot, solid sample spoon with a beveled, sharpened drive shoe.
	Cobble or boulder (Core-drilled)
	Cobbles or boulders, continuous or nested (Core-drilled and/or blasted and chopped)
El. 614.1	Elevation of bedrock surface
	Rock symbol
	Rock Core Recovery 0 - 25%
	Rock Core Recovery 25 - 50%
	Rock Core Recovery 50 - 75%
	Rock Core Recovery 75 - 90%
	Rock Core Recovery 90 - 100%

EXPLORATION NOTES

Water levels recorded during subsurface explorations seldom correspond with the natural level of free ground water, except in extensive and thick deposits of sands and gravels which are sufficiently pervious to permit rapid stabilization of water levels in the exploratory hole. Absence of subsurface water in the graphic log of any exploration is not necessarily to be construed that ground water will not be encounted in excavation at that location.

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the overburden and rocks of this region are anticipated, and if encountered, such variations will not be considered as differing "Materially" from represented conditions within the purview of Article 4 of the Contract.

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
	L.H.L.	C.M.

SUBMITTED: H.C. Haley, HEAD GEOLOGY SECTION
PROJECT ENGINEER: A.P. Martin
APPROVAL RECOMMENDED: CHIEF, FOR & MAT'LS BRANCH
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
CONANT BROOK DAM
HIGHWAY RELOCATIONS AND ACCESS ROAD
FOUNDATION EXPLORATIONS NO. 2
CHICOPEE RIVER MASSACHUSETTS
DATE APRIL 1964

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-64-43
DRAWING NUMBER
CON-9
SHEET 62



1964 Reports

Specifications for construction of Dam, relocation of highways and appurtenant structures.

Dam	Conant Brook Dam
Name	Massachusetts Comm
Name	U S Army Engineers
Water	Conant Brook
Water	Connecticut River

SERIAL NO. CIV. ENG.-19-016-64-43

CONNECTICUT RIVER FLOOD CONTROL PROJECT

CONANT BROOK DAM

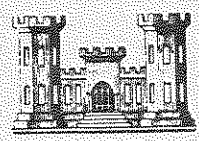
CHICOPEE RIVER, MASSACHUSETTS

SPECIFICATIONS

FOR THE

CONSTRUCTION OF DAM, HIGHWAY RELOCATIONS AND APPURTENANT STRUCTURES

approved
4-14-64



U.S. Army Engineer Division, New England
Corps of Engineers
Waltham, Mass.

APRIL 1964

NEW ENGLAND DIVISION

Wear Your HARD HAT



"a little care makes mishaps rare"

The Head You Save WILL BE YOUR OWN

U.S. ARMY CORPS OF ENGINEERS

Serial No. CIVENG-19-016-64-43

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR

CONSTRUCTION

OF

CONANT BROOK DAM

HIGHWAY RELOCATIONS

AND

APPURTENANT STRUCTURES

MONSON, MASSACHUSETTS

2 APRIL 1964

THESE FACILITIES WERE DESIGNED BY NED

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

TABLE OF CONTENTS

INVITATION FOR BIDS

PART I - GENERAL CONDITIONS
PART II - SPECIAL CONDITIONS
PART III - TECHNICAL PROVISIONS

Section No.	Title
1	PREPARATION OF SITE
2	CONTROL AND DIVERSION OF WATER
3	EXCAVATION
4	GRAVEL BASE AND SURFACE COURSES
5	EMBANKMENTS - DAM AND DIKE
5A	HIGHWAY FILL
6	ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL
7	FOUNDATION DRILLING AND GROUTING
8	ANCHOR BARS
9	CONCRETE
10	CONCRETE PIPE CONDUIT
11	EXCAVATION, TRENCHING AND BACKFILLING FOR CULVERTS AND DRAINS
12	STORM DRAINAGE SYSTEM
13	BUBBLE GAGE SHELTER
14	MISCELLANEOUS ITEMS OF WORK
15	BITUMINOUS CONCRETE PAVEMENTS
16	BITUMINOUS PRIME COATS AND SURFACE TREATMENTS
17	TOPSOILING, SEEDING, AND MULCHING
18	STORAGE BUILDING

STANDARD FORM 20
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

REFERENCE

Serial No. CIVENG-19-016-64-43

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE
2 April 1964

NAME AND LOCATION OF PROJECT

CONSTRUCTION OF CONANT BROOK DAM, HIGHWAY RELOCATIONS, AND APPURTENANT STRUCTURES, MONSON, MASSACHUSETTS

DEPARTMENT OR AGENCY

Department of the Army
Corps of Engineers

BY (Issuing office)
Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham, Mass. 02154

Sealed bids in duplicate for the work described herein will be received until 2:00 p.m., E.D.S.T., 7 May 1964, at the address of the Division Engineer, U.S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Mass. and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

1. Bids may be mailed to: The Division Engineer, U.S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Mass. 02154

2. In lieu of mailing, bids may be delivered in advance to: The Bids Receiving Desk, Building 109S at the above address. Just prior to the bid opening, bids may be delivered directly to the Contracting Officer in Building 126 (Theater).

3. Bids will be opened at: Building 126 (Theater), 424 Trapelo Road, Waltham, Mass.

4. Bids shall be submitted on Standard Form 21 (Bid Form - Construction Contract) and shall be prepared in accordance with Standard Form 22 (Instructions to Bidders). The bidder who is awarded the contract will be required to execute the standard contract form for construction contracts (Standard Form 23) attached hereto with Standard Form 23A, General Provisions, and supplement thereto, which set forth the contract clauses.

5. Bid guarantee hereinafter specified in a penal sum of 20% of the bid price or $3,000,000, whichever is the lesser, will be required if the bid price is in excess of $2,000. If the guarantee is submitted in the form of a bid bond, Standard Form 24 will be used and the bid bond penalty may be expressed in terms of a percentage of the bid price or may be expressed in dollars and cents.

Description of Work - The work consists of furnishing all plant, labor, materials, and equipment and performing all work in strict accordance with the specifications, drawings and schedules for the construction of dam, dike, highway relocations and appurtenant structures for Conant Brook Dam and Reservoir, as follows:

Specifications entitled: "CONSTRUCTION OF CONANT BROOK DAM, HIGHWAY RELOCATIONS, AND APPURTENANT STRUCTURES, MONSON, MASSACHUSETTS."

Drawings as listed in Paragraph SC-3 of the specifications.

Schedules as set forth in the Bid Form.

BIDS MUST SET FORTH FULL, ACCURATE, AND COMPLETE INFORMATION AS REQUIRED BY THIS INVITATION FOR BIDS, INCLUDING ATTACHMENTS. THE PENALTY FOR MAKING FALSE STATEMENTS IN BIDS IS PRESCRIBED IN 18 U.S.C. 1001.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

1. Each bidder shall, upon request of the Contracting Officer, furnish a list of the plant available to the bidder and proposed for use on the work.

2. Bidders are required to acknowledge receipt of all amendments to this invitation on the Bid Form (Standard Form 21) in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause the bid to be considered not responsive to the invitation, which would require rejection of the bid.

3. If the bidder, by checking the appropriate box provided therefor in this bid, has represented that he has employed or retained a company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure his contract, he may be requested by the Contracting Officer to furnish a completed Standard Form 119, "Contractor's Statement of Contingent or Other Fees for Soliciting or Securing Contract". If the bidder has previously furnished a completed Standard Form 119 to the office issuing this Invitation for Bids, he may accompany his bid with a signed statement, (a) indicating when such completed form was previously furnished, (b) identifying by number the previous invitation for bids or contract, if any, in connection with which such form was submitted, and (c) representing that the statements in such previously furnished form are applicable to this bid.

4. Modifications Prior to Date Set for Opening Bids. - The right is reserved, as the interest of the Government may require, to revise or amend the specifications and/or drawings prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to this Invitation for Bids. Copies of such amendments as may be issued will be furnished to all prospective bidders. If the revisions and amendments are of a nature which require material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the Division Engineer will enable bidders to revise their bids. In such cases, the amendment will include an announcement of the new date for opening bids.

5. The Government further reserves the right to make award on any or all schedules of any bid, unless the bidder qualifies such bid by specific limitation; also to make award to the bidder whose aggregate bid on any combination of bid schedules is low. For the purpose of this Invitation for Bids, the word "item", as used in paragraph 10(c) of Standard Form 22, shall be considered to mean "schedule".

6. Repeal of Federal Transporation Tax on Property. - Section 4, Tax Rate Extension Act of 1958, (Act 30 June 1958, Public Law 85-475), in Part repealed the Federal excise tax on the transportation of property effective with respect to amounts paid for such transportation on and after August 1958.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

Accordingly, any bid price(s) submitted hereunder which include freight charges should exclude any amount(s) for Federal excise tax on the transportation of property.

Wherein these instructions conflict with Clause 35 "Federal, State and Local Taxes", of the Supplement to General Provisions (Construction Contracts) S.F. 23A, April 1961 Edition, these instructions will govern.

7. Notice Regarding Buy American Act (Sep. 1962). - a. The Department of Defense has changed its Buy American Act rules. Generally speaking, exception from the Buy American Act will be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Office of the Secretary of Defense.

b. Where it is proposed to furnish nondomestic construction material, bids or proposals shall set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.

8. Affiliated Bidders. - a. Business concerns are affiliates of each other when either directly or indirectly (i) one concern controls or has the power to control the other, or (ii) a third party controls or has the power to control both.

b. Each bidders shall submit upon request of the Government an affidavit containing information as follows:

(i) whether the bidder has any affiliates;

(ii) the names and addresses of all affiliates of the bidder; and

(iii) the names and addresses of all persons and concerns exercising control or ownership of the bidder and any or all of his affiliates, and whether as common officers, directors, stockholders holding controlling interest, or otherwise.

Failure to furnish such an affidavit promptly upon request may result in rejection of the bid.

Rev. 5/7/63
Corr 2/7/64

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

9. Parent Company Statement. - Bidders must execute the statement attached to and forming a part of the Bid Form furnishing information as to Parent Company and Employer Identification Number and submit one executed copy with the bid if the amount of the bid exceeds $10,000. This requirement is in addition to the information required under the provisions of the Affiliated Bidders clause above.

10. Notice of Total Small Business Set-Aside (Nov. 1963).
a. Restriction. - Bids or proposals under this procurement are solicited from small business concerns only and this procurement is to be awarded only to one or more small business concerns. This action is based on a determination by the Contracting Officer, alone or in conjunction with a representative of the Small Business Administration, that it is in the interest of maintaining or mobilizing the Nation's full productive capacity, in the interest of war or national defense programs, or in the interest of assuring that a fair proportion of Government procurement is placed with small business concerns. Bids or proposals received from firms which are small business concerns shall be considered nonresponsive and shall be rejected.

b. Definition. - A "small business concern" is a concern, including its affiliates, which is independently owned and operated, is not dominant in the field of operation in which it is bidding on Government contracts, and can further qualify under the criteria set forth in regulations of the Small Business Administration (Code of Federal Regulations, Title 13, Section 121.3-8). For construction, alteration, or repair (including painting and decorating), of buildings,bridges, roads, or other real property, the average annual receipts of the concern and its affiliates for its preceding three fiscal years must not exceed $7,500,000, except that if the concern is located in Alaska, such receipts must not exceed $9,375,000. For dredging, the average annual receipts of the concern and its affiliates for its preceding three fiscal years must not exceed $5,000,000, except that if the concern is located in Alaska, such receipts must not exceed $6,250,000.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U.S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

11. Sets of drawings, full size or reduced size, and specifications will be furnished upon receipt of payment of $10.00 per set. If individual plan sheets are requested, they will be furnished at the rate of $0.10 for reduced size and $0.50 for full size for each sheet requested, but with a minimum charge of $1.00 except as provided for below. No refund of the payment for drawings will be made and the drawings need not be returned to the Division Engineer. Additional copies of the specifications alone will be furnished an applicant at the rate of $1.00 per copy. Payments will be made by cash, check, or money order and delivered to the Finance and Accounting Officer, Corps of Engineers, Department of the Army, 424 Trapelo Road, Waltham, Mass. 02154. Checks and money orders should be made payable to "Treasurer of the United States". If the project is cancelled or no award is made under the invitation, upon request, refund of the payment for the plans and specifications will be made thereon upon return thereof to the issuing office, all charges prepaid.

12. Technical inquiries regarding the plans and specifications during the bidding period shall be made to the following:

Mr. Francis M. Griffin, Waltham, Mass., TWinbrook 4-2400, Ext. 288.

13. The value of work involved is approximately $1,500,000.

14. CAUTION TO BIDDERS-LATE BIDS. - See Standard Form 22, "Instructions to Bidders", for the special provision entitled "Late Bids and Modifications or Withdrawals" which provides that late bids and modifications or withdrawals thereof sent through the mails will be considered ONLY IF SENT BY REGISTERED MAIL, OR BY CERTIFIED MAIL FOR WHICH A POSTMARKED RECEIPT HAS BEEN OBTAINED AS SPECIFIED IN SUCH PROVISION. (APR. 1962).

15. Reverse Signal Alarms are required in accordance with Par. SC-30.

16. Performance of Work by Contractor (Clause 40 of ALTERATIONS TO STANDARD FORM 23A AND ADDITIONAL GENERAL PROVISIONS). - Each bidder shall submit a description of the work which he will perform with his own organization (e.g., earthwork, paving, concrete, etc.), the percentage of the total work this represents, and the estimated cost thereof.

17. Safety Requirements. - Paragraph GC-16 of the General Conditions of the proposed specification incorporates and makes a part of the contract the Corps of Engineers Manual, EM 385-1-1, dated 13 March 1958,

entitled "General Safety Requirements", as amended. Such requirements will be strictly enforced and adhered to by the contractor. Those bidders who do not have a copy of this manual, or who are not aware of its contents may familiarize themselves with its provisions by contacting the Resident Engineer at the site or by visiting the Division Office in Waltham, Mass. Copies of this manual will be furnished the successful bidder after contract award has been made.

18. The Government reserves the right to award a contract under this invitation notwithstanding the expiration of wage rate determination of the Secretary of Labor set forth in SC-6. If the wage rate determination has expired (29 CFR 5.4(a)) a new wage rate determination may be substituted for the expired determination and award made on the basis of the bid as submitted without a change in the bid price.

19. Compliance Reports re Non-Discrimination Clause. - Bidders must complete statement attached to and forming part of the Bid Form relative to compliance reports re non-discrimination clause.

C

PART I

GENERAL CONDITIONS
(Index)

Paragraph No.	Paragraph Title	Page No.
GC-1	Scope of Work	GC-1
GC-2	Character of Work and Mechanics	GC-1
GC-3	Site Investigation	GC-1
GC-4	Operations and Storage Areas	GC-1
GC-5	Progress Charts, and Requirements for Overtime Work	GC-2
GC-6	Subcontractors	GC-3
GC-7	Quality of Articles, Materials and Equipment	GC-3
GC-8	Protection of Material and Work	GC-4
GC-9	Protection of Existing Structures, Utilities, Work and Vegetation	GC-4
GC-10	Possession Prior to Completion	GC-4
GC-11	Reserved	
GC-12	Labor Reports	GC-5
GC-13	Cleaning Up	GC-5
GC-14	Definitions	GC-5
GC-15	Bonds	GC-6
GC-16	Accident Prevention	GC-6
GC-17	Inspection	GC-7
GC-18	Items of Work	GC-7

PART I

GENERAL CONDITIONS

GC-1. SCOPE OF WORK. - The work to be performed under this contract consists of furnishing all plant, materials, equipment, supplies, labor and transportation, including fuel, power, water (except any materials, equipment, utility or service, if any, specified herein to be furnished by the Government), and performing all work as required in the statement of work in the contract, in strict accordance with the specifications, schedules, and drawings, all of which are made a part hereof, and including such detail drawings as may be furnished by the Contracting Officer from time to time during the prosecution of the work in explanation of said drawings.

GC-2. CHARACTER OF WORK AND MECHANICS. - The work shall be executed in the best and most workmanlike manner by qualified, careful and efficient mechanics in strict accordance with the drawings and specifications.

GC-3. SITE INVESTIGATION. - The contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government assumes no responsibility for any conclusions or interpretations made by the contractor on the basis of the information made available by the Government. The Government also assumes no responsibility for any understanding or representations made by its officers or agents during or prior to the execution of this contract, unless (i) such understanding or representations are expressly stated in the contract and (ii) the contract expressly provides that the responsibility therefor is assumed by the Government. Representations which are not expressly stated in the contract and for which liability is not expressly assumed by the Government in the contract shall be deemed only for the information of the contractor.

GC-4. OPERATIONS AND STORAGE AREAS. - a. All operations of the contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting

Officer. No unauthorized or unwarranted entry upon or passage through, or storage or disposal of materials shall be made upon Government premises. Government premises adjacent to the construction will be made available for use by the contractor without cost whenever such use will not interfere with other Government uses or purposes. The contractor shall be liable for any and all damage caused by him to such Government premises. The contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature or kind arising from any use, trespass or damage occasioned by his operations on premises of third persons.

b. Temporary buildings (storage sheds, shops, offices, etc.), may be erected by the contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by contractor without expense to the Government. Such temporary buildings and/or utilities shall remain the property of the contractor and will be removed by him at his expense upon the completion of the work. With the written consent of the Contracting Officer, such buildings and/or utilities may be abandoned and need not be removed.

c. The contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways or construct and use such temporary roadways as may be authorized by the Contracting Officer. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, state or local law or regulation. When it is necessary to cross curbings or sidewalks, protection against damage shall be provided by the contractor and any damaged roads, curbings, or sidewalks shall be repaired by, or at the expense of the contractor.

GC-5. PROGRESS CHARTS AND REQUIREMENTS FOR OVERTIME WORK. - a. The contractor shall within 5 days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The contractor shall revise the schedule as necessary to keep it current, shall enter on the chart the actual progress at the end of each week or at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three copies thereof. If the contractor fails to submit a progress schedule within the time herein prescribed, the Contracting Officer may withhold approval of progress payment estimates until such time as the contractor submits the required progress schedule.

b. If, in the opinion of the Contracting Officer, the contractor falls behind the progress schedule, the contractor shall take

such steps as may be necessary to improve his progress and the Contracting Officer may require him to increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant, and to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Government.

c. Failure of the contractor to comply with the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the Contracting Officer may terminate the contractor's right to proceed with the work, or any separable part thereof, in accordance with the delays-damages article of the contract.

GC-6. SUBCONTRACTORS. - Within 7 days after the award of any subcontract either by himself or a subcontractor, the contractor shall deliver to the Contracting Officer a statement setting forth the name and address of the subcontractor and a summary description of the work subcontracted. The contractor shall, at the same time, furnish a statement signed by the subcontractor acknowledging the inclusion in his subcontract of Clause 21 of Standard Form 23A and all clauses set forth in Standard Form 19A. If, for sufficient reason, at any time during the progress of the work, the Contracting Officer determines that any subcontractor is incompetent or undesirable, he will notify the contractor accordingly and steps will be taken immediately for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same regulations. Nothing contained in this contract shall create any contractual relation between the subcontractor and the Government.

GC-7. QUALITY OF ARTICLES, MATERIALS AND EQUIPMENT. - a. Where articles, materials and equipment are required to conform to standard specifications or tests of the Government or other authorities incorporated by reference, they will conform to the respective editions, including amendments, specified.

b. Any samples and descriptive data required shall -

(1) Be submitted within the time specified in these specifications or, if not specified, within a reasonable time before use to permit inspection and testing.

(2) Be shipped prepaid and delivered as specified in these specifications, or as directed by the Contracting Officer.

(3) Be marked to show the name of the material, trade name of manufacturer, place of origin, name and location of the project where the material represented by the sample is to be used, and the name of the contractor submitting the sample.

c. Samples not subjected to destructive tests may be retained until completion of the work but thereafter will be returned to the contractor, if he so requests in writing, at his own expense. Failure of any sample to pass the specified requirements will be sufficient cause for refusal to consider further any samples from the same manufacturer whose materials failed to pass the tests.

GC-8. PROTECTION OF MATERIAL AND WORK. - The contractor shall at all times protect and preserve all materials, supplies and equipment of every description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to inclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies and work performed are not adequately protected by the contractor such property may be protected by the Government and the cost thereof may be charged to the contractor or deducted from any payments due to him.

GC-9. PROTECTION OF EXISTING STRUCTURES, UTILITIES, WORK AND VEGETATION. - a. Existing structures, utilities, or other work that is to be retained shall be protected, to the extent possible, by the contractor during construction operations and if damaged shall be reported immediately to the Contracting Officer. Repairs, if required by the Contracting Officer, shall be accomplished by the contractor at no additional cost to the Government, except repairs to underground structures and lines, the location of which has not been shown or is not known or made known to the contractor. If the Contracting Officer determines that repairs to such underground structures or lines shall be made by the contractor, such repairs shall be accomplished under the applicable clause in the General Provisions of the contract. When utility lines that are to be removed are encountered, the contractor shall notify the Contracting Officer in ample time for measures to be taken to prevent interruption of the service.

b. The contractor will preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the Contracting Officer. The contractor will be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stockpiling of materials or tracking of grass areas by equipment.

c. Care will be taken by the contractor in felling trees authorized for removal to avoid any unnecessary damage to vegetation that is to remain in place. Any limbs or branches of trees broken during such operations, shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the Contracting Officer. The contractor will be liable for or may be required to replace or restore at his own expense all vegetation not protected and preserved as required herein that may be destroyed or damaged.

GC-10. POSSESSION PRIOR TO COMPLETION. - The Government shall have the right to take possession of or use any completed or partially completed

part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract. If such prior possession or use by the Government delays the progress of the work or causes additional expenses to the contractor, an equitable adjustment in the contract price and/or the time of completion will be made and the contract shall be modified in writing accordingly.

GC-11. RESERVED

GC-12. LABOR REPORTS. - The contractor shall promptly furnish, and shall cause any subcontractors to furnish in like manner, within 7 days after the regular payment date of each weekly payroll, to the Contracting Officer, a copy of such payroll together with a statement of compliance with respect to the wages paid each of its employees (which shall not be deemed to apply to persons in classifications higher than laborers and mechanics and those who are the immediate supervisors of such employees) engaged on the work. If the contractor or any of his subcontractors fails to furnish copies of such payrolls, the Contracting Officer may disapprove all or part of any progress payment estimate for the period covered by such payrolls until they are received by him. The contractor shall also prepare and furnish such labor reports as may be required by the Department of Labor.

GC-13. CLEANING UP. - The contractor shall, at all times, keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the Government. Upon completion of the construction, the contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the Contracting Officer.

GC-14. DEFINITIONS. - a. Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the direction, requirement, order, designation, or prescription of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory" or words of like import shall mean approved by, or acceptable to, or satisfactory to the Contracting Officer, unless expressly stated.

b. Wherever the words "shown", or "indicated" are used in the specifications, it shall be understood that "shown" or "indicated on the drawings" is intended, unless otherwise stated.

c. Basic rate as used in Clause 2, "Work Hours Act of 1962 -- Overtime Compensation", of Standard Form 19A means the basic hourly straight time wage rate actually paid laborers and mechanics and is not necessarily the same as the minimum hourly rate referred to in Clause 1,

"Davis-Bacon Act", of Standard Form 19A and in the paragraph of the specifications entitled "Rates of Wages".

GC-15. BONDS. - a. Payment Bond. - If the contract exceeds $2,000, the contractor agrees to furnish a payment bond with good and sufficient surety or sureties acceptable to the Government for the protection of persons furnishing material or labor in connection with the performance of the work under this agreement on U. S. Standard Form No. 25-A or U. S. Standard Form No. 27-A. The penal sum of such payment bond will be as follows: (1) When the contract price is $1,000,000 or less, 50 percent of the contract price; (2) When the contract price is in excess of $1,000,000, but no more than $5,000,000, 40 percent of the contract price; (3) When the contract price is more than $5,000,000, $2,500,000.

b. Performance Bond. - If the contract price exceeds $2,000, the contractor further agrees to furnish a performance bond with good and sufficient surety or sureties acceptable to the Government in connection with the performance of the work under this agreement on U. S. Standard Form No. 25 or U. S. Standard Form No. 27. The penal sum of such performance bond will be 100 percent of the contract price.

c. Any bonds required hereunder will be dated as of the same date as the contract and will be furnished by the contractor to the Government at the time the contract is executed.

GC-16. ACCIDENT PREVENTION. - a. In order to provide safety controls for protection to the life and health of employees and other persons; for prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract; the contractor will comply with all pertinent provisions of Corps of Engineers Manual, EM 385-1-1, dated 13 March 1958, entitled "General Safety Requirements," as amended, and will also take or cause to be taken such additional measures as the Contracting Officer may determine to be reasonably necessary for the purpose.

b. Prior to commencement of work, the contractor will -

(1) Submit in writing his proposals for effectuating this provision for Accident Prevention.

(2) Meet in conference with representative of the Contracting Officer to discuss and develop mutual understandings relative to administration of the over-all safety program.

c. During the performance of work under the contract, the contractor shall comply with all procedures prescribed by the Contracting

Officer for the control and safety of persons visiting the job site and will comply with such requirements to prevent accidents as may be specified under the SPECIAL CONDITIONS of these specifications or issued by the Contracting Officer.

d. The contractor will maintain an accurate record of, and will report to the Contracting Officer in the manner and on the forms prescribed by the Contracting Officer, exposure data and all accidents resulting in death, traumatic injury, occupational disease, and/or damage to property, materials, supplies and equipment incident to work performed under this contract.

e. The Contracting Officer will notify the contractor of any non-compliance with the foregoing provisions and the action to be taken. The contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the contractor or his representative at the site of the work, shall be deemed sufficient for the purpose. If the contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop order shall be made the subject of claim for extension of time or for excess costs or damages by the contractor.

f. Compliance with the provisions of this article by subcontractors will be the responsibility of the contractor.

GC-17. INSPECTION. - The work will be conducted under the general direction of the Contracting Officer and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract. No inspector is authorized to change any provision of the specifications without written authorization of the Contracting Officer, nor shall the presence or absence of an inspector relieve the contractor from any requirements of the contract. As soon as practicable after the completion of the entire work, or any divisible part thereof as may be designated in these specifications, a thorough examination thereof will be made by the Contracting Officer at the site of the work. If such work is found to comply fully with the requirements of the contract, it will be accepted; and final payment therefor will be made in accordance with the article of the contract entitled "Payments to Contractors."

GC-18. ITEMS OF WORK. - A brief description of each item and the estimated quantity thereof are shown in the schedule attached to the Bid Form and listed in the Statement of Work in the contract. Unless otherwise provided in the SPECIAL CONDITIONS, within the limit of available funds, the contractor will be required to complete the work specified herein in accordance with the contract and at the contract price or prices.

PART II

SPECIAL CONDITIONS
(INDEX)

Paragraph No.	Paragraph Title	Page No.
SC-1	Commencement, Prosecution and Completion of Work	SC-1
SC-2	Omitted	
SC-3	Contract Drawings and Specifications	SC-1
SC-4	Shop Drawings	SC-4
SC-5	Physical Data	SC-4
SC-6	Rates of Wages	SC-7
SC-7	Variations in Estimated Quantities	SC-9
SC-8 & SC-9	Omitted	
SC-10	Water	SC-10
SC-11	Electricity	SC-11
SC-12	Omitted	
SC-13	Layout of Work and Surveys	SC-11
SC-14	Payments for Mobilization	SC-12
SC-15	Damage to Work	SC-12
SC-16 to SC-23, Incl.	Omitted	
SC-24	Funds Available for Payments	SC-13
SC-25 to SC-27, Incl.	Omitted	
SC-28	Scheduling and Determination of Progress	SC-15

Paragraph No.	Paragraph Title	Page No.
SC-29	Time Extensions	SC-16
SC-30	Reverse Signal Alarms	SC-16
SC-31 & SC-32	Omitted.	
SC-33	Certificates of Compliance	SC-17
SC-34 to SC-36, Incl.	Omitted	
SC-37	Contract Bid Breakdown	SC-17
SC-38	Temporary Heat	SC-17
SC-39	Omitted	
SC-40	Soils and Materials Control	SC-18
SC-41	Construction Sign	SC-18
SC-42	Safety Sign	SC-19
SC-43	Accident Prevention	SC-19
SC-44 & SC-45	Omitted	
SC-46	Government Field Office	SC-22
SC-47	Identification of Mechanized Equipment	SC-22
SC-48	Omitted	
SC-49	Project Bulletin Board	SC-22
SC-50 & SC-51	Omitted	
SC-52	Deviations from Contract Requirements	SC-22
SC-53	Contractor's Options	SC-23
SC-54 & SC-55	Omitted	

Paragraph No.	Paragraph Title	Page No.
SC-56	Approved Aggregate Sources	SC-23
SC-57	Warning Signs	SC-24
SC-58	Plant	SC-24
SC-59	Payment	SC-24
SC-60	Commonwealth Standards	SC-25
SC-61	Factors Affecting the Prosecution of the Work	SC-25
SC-62	Definition of "Site of the Work" for Purposes of the Provisions of the Davis-Bacon Act, 40 U.S.C. 276a	SC-28
SC-63	Non-Discrimination Clause - Compliance Reports	SC-29

PART II

SPECIAL CONDITIONS

SC-1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK. - a. The contractor will be required to commence work under this contract within 15 calendar days after the date of receipt by him of notice to proceed, to prosecute said work with faithfulness and energy, and to complete the entire work ready for use not later than 750 calendar days after date of receipt by him of notice to proceed, except that the storage building will be completed in sufficient time to permit the required soils, concrete and materials control at the project site as required under Paragraph SC-40 to be performed. The time stated for completion shall include final clean-up of the premises. Paragraph SC-61 contains intermediate completion dates for segments of the work.

b. Time Extension for Topsoiling and Seeding. - In the event the contract completion date, as established in subparagraph "a" above, is thirty (30) days or more after the limiting date established for seeding in the Technical Provisions herein, the contract completion date for topsoiling and seeding will be the last date of the next succeeding period specified as acceptable for seeding.

SC-2. OMITTED.

SC-3. CONTRACT DRAWINGS AND SPECIFICATIONS. - Twenty sets of contract drawings (full-size or reduced size) and specifications will be furnished the contractor without charge, except for applicable publications incorporated into the Technical Provisions by reference. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the following contract drawings and maps, all of which form a part of these specifications and are available in the office of the U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Massachusetts.

Sheet No.	Title	Rev. No.

Drawing No. CON-8

1	Reservoir Map and Index
2	General Plan
3	Dam Embankment - Sections
4	Dam Embankment - Profiles
5	Outlet Works - Plan, Profile and Sections
6	Outlet Works - Inlet Structures - Concrete Details
7	Outlet Works - Conduit - Plans and Sections
8	Outlet Works - Outlet Structure - Concrete Details
9	Spillway - Plan, Profile and Sections

Sheet No.	Title	Rev. No.

Drawing No. CON-8 (Continued)

10	Spillway - Concrete Details No. 1
11	Spillway - Concrete Details No. 2
12	Dike - Plan, Profiles and Sections
13	Staff Gages, Log Boom and Parking Area
14	Bubble Gage Shelter - Details
15	Bubble Gage Shelter - Steel Reinforcement
16	Plaque - Sections and Detail
17	Plan of Foundation Explorations
18	Geologic - Log Sections - Dam
19	Geologic - Log Sections - Spillway
20	Geologic - Log Sections - Conduit
21	Record of Foundation Explorations No. 1
22	Record of Foundation Explorations No. 2
23	Record of Foundation Explorations No. 3
24	Record of Foundation Explorations No. 4
25	Plan of Borrow Explorations
26	Record of Borrow Explorations
27	Hydrographs

Drawing No. CON-9

1	Highway Relocations and Access Road - General Plan and Index
2	Highway Relocations and Access Road - Wales Road - Plan and Profile No. 1
3	Highway Relocations and Access Road - Wales Road - Plan and Profile No. 2
4	Highway Relocation and Access Road - Wales Road - Plan and Profile No. 3
5	Highway Relocations and Access Road - Wales Road - Plan and Profile No. 4
6	Highway Relocations and Access Road - Wales Road - Plan and Profile No. 5
7	Highway Relocations and Access Road - Wales Road - Plan and Profile No. 6
8	Highway Relocations and Access Road - Wales Road - Plan and Profile No. 7
9	Wales Road - Cross Sections - Sta. 0/00 to Sta. 3/00
10	Wales Road - Cross Sections - Sta. 3/50 to Sta. 5/00
11	Wales Road - Cross Sections - Sta. 5/50 to Sta. 6/94.99
12	Wales Road - Cross Sections - Sta. 7/50 to Sta. 9/50
13	Wales Road - Cross Sections - Sta. 10/00 to Sta. 11/00
14	Wales Road - Cross Sections - Sta. 11/50 to Sta. 13/50
15	Wales Road - Cross Sections - Sta. 14/00 to Sta. 15/00

Sheet No.	Title	Rev. No.

Drawing No. CON-9 (Continued)

16	Wales Road - Cross Sections - Sta. 15/50 to Sta. 17/00
17	Wales Road - Cross Sections - Sta. 17/50 to Sta. 19/50
18	Wales Road - Cross Sections - Sta. 20/00 to Sta. 22/50
19	Wales Road - Cross Sections - Sta. 23/00 to Sta. 25/50
20	Wales Road - Cross Sections - Sta. 26/00 to Sta. 31/50
21	Wales Road - Cross Sections - Sta. 32/00 to Sta. 38/50
22	Wales Road - Cross Sections - Sta. 39/00 to Sta. 42/00
23	Wales Road - Cross Sections - Sta. 42/50 to Sta. 45/00
24	Wales Road - Cross Sections - Sta. 45/50 to Sta. 51/50
25	Wales Road - Cross Sections - Sta. 52/00 to Sta. 54/50
26	Wales Road - Cross Sections - Sta. 55/00 to Sta. 57/50
27	Wales Road - Cross Sections - Sta. 58/00 to Sta. 60/50
28	Wales Road - Cross Sections - Sta. 61/00 to Sta. 62/50
29	Wales Road - Cross Sections - Sta. 63/00 to Sta. 65/00
30	Wales Road - Cross Sections - Sta. 65/50 to Sta. 68/50
31	Wales Road - Cross Sections - Sta. 69/00 to Sta. 71/50
32	Wales Road - Cross Sections - Sta. 72/00 to Sta. 74/50
33	Wales Road - Cross Sections - Sta. 75/00 to Sta. 77/00
34	Wales Road - Cross Sections - Sta. 77/50 to Sta. 78/00
35	Wales Road - Cross Sections - Sta. 78/50 to Sta. 79/00
36	Wales Road - Cross Sections - Sta. 79/50 to Sta. 80/50
37	Wales Road - Cross Sections - Sta. 81/50 to Sta. 83/50
38	Wales Road - Cross Sections - Sta. 84/00 to Sta. 86/00
39	Wales Road - Cross Sections - Sta. 86/50 to Sta. 88/50
40	Wales Road - Cross Sections - Sta. 89/00 to Sta. 90/50
41	Wales Road - Cross Sections - Sta. 91/00 to Sta. 93/00
42	Wales Road - Cross Sections - Sta. 93/50 to Sta. 95/00
43	Wales Road - Cross Sections - Sta. 95/50 to Sta. 98/00
44	Wales Road - Cross Sections - Sta. 98/50 to Sta. 100/50
45	Wales Road - Cross Sections - Sta. 34/80, Sta. 62/64, Sta. 81/35
46	Wales Road - Cross Sections - Sta. 60/25RT, Sta. 69/00-23'RT
47	Highway Relocations and Access Road - Wales Road - Culvert Crossing - Conant Brook - Plan and Sections.
48	Highway Relocations and Access Road - Wales Road - Culvert Crossing - Vinica Brook - Plan and Sections
49	Wales Road Culvert Crossings - Conant and Vinica Brooks - Profiles
50	Highway Relocations and Access Road - Wales Road - Turnoff-Plan
51	Wales Road - Turnoff Cross Sections - Sta. 2/00 to Sta. 8/50
52	Highway Relocations and Access Road - Access Road - Plan and Profile No. 1

Sheet No.	Title	Rev.No.

Drawing No. CON-9 (Continued)

53	Highway Relocations and Access Road - Access Road - Plan and Profile No. 2 - Turnarounds and Sections
54	Access Road - Cross Sections - Sta. 0/00 to Sta. 4/50
55	Access Road - Cross Sections - Sta. 5/00 to Sta. 6/50
56	Access Road - Cross Sections - Sta. 7/00 to Sta. 9/50
57	Access Road - Cross Sections - Sta. 10/00 to Sta. 11/50
58	Access Road - Cross Sections - Sta. 12/00 to Sta. 14/00
59	Access Road - Cross Sections - Sta. 14/50 to Sta. 15/50 and Sta. 4/95 Skew
60	Highway Relocations and Access Road - Typical Road Sections
61	Highway Relocations and Access Road - Foundation Explorations No. 1
62	Highway Relocations and Access Road - Foundation Explorations No. 2

SC-4. SHOP DRAWINGS. - The contractor shall submit to the Contracting Officer for approval seven (7) copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete, shall be checked by the contractor prior to submission, and shall contain all required detailed information. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the Contracting Officer. Five (5) sets of all shop drawings will be retained by the Contracting Officer and two sets will be returned to the contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the contractor of the responsibility for any errors which may exist, as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work. (See Paragraph SC-50, DEVIATIONS FROM CONTRACT REQUIREMENTS.) The submission by the contractor will be accompanied by ENG Form 4025, in seven copies. In addition, an information copy of this form, without inclosures, will be forwarded by the contractor to the Resident Engineer, Area Engineer, and Design Branch, Engineering Division, NED. ENG Form 4025 will be furnished to the contractor by the Government.

SC-5. PHYSICAL DATA. - Information and data furnished or referred to below are furnished for information only and it is expressly understood that the Government will not be responsible for any interpretation or conclusion drawn therefrom by the contractor.

a. Physical Conditions. - The physical conditions indicated on the drawings and in the specifications are the results of site investigations by surveys, borings and test pits. Soil samples and rock cores obtained from subsurface explorations made by the Government, field reports of explorations, records of water levels in observation wells, and results and data of all tests made by the Government on soil samples are available for examination and review at the Corps of Engineers, Foundations and Materials Branch, New England Division Headquarters, 424 Trapelo Road, Waltham, Massachusetts, telephone TWinbrook 4-2400, Ext. 387. The results of laboratory tests performed on soil samples obtained from subsurface explorations in the foundation areas of embankments and structures and in the Borrow Area are shown on Pages A-2 through A-12 (11 sheets) inserted at the end of the SPECIAL CONDITIONS The classification of soil samples is in accordance with Drawing No. NEDGL 61-5C, "Unified Soil Classification", attached at the end of the SPECIAL CONDITIONS

b. Weather Conditions. -

MONTHLY TEMPERATURES
(Degrees Fahrenheit)

	Worcester, Mass.			Westover Field, Mass.		
Elevation (feet msl)	628			240		
Years of Record	68			19		
Month	Mean	Max.	Min.	Mean	Max.	Min.
January	25.4	69	-18	24.9	65	-22
February	25.5	67	-24	27.8	85	-18
March	34.9	84	-6	36.2	86	-13
April	45.8	91	8	47.6	87	13
May	57.3	92	25	58.1	93	29
June	65.9	98	33	67.4	102	37
July	71.0	102	41	72.3	97	45
August	69.0	99	35	70.2	99	36
September	62.0	100	26	62.7	101	27
October	51.7	89	13	52.6	89	17
November	40.2	81	3	41.7	81	8
December	28.5	67	-17	28.5	64	-15
Annual	48.2	102	-24	49.2	102	-22

MONTHLY PRECIPITATION RECORD
(In Inches)

	Hubbardston, Mass.			Ware #2, Mass.		
Elevation (feet msl)	1,030			500		
Years of Record	43			30		
Month	Mean	Max.	Min.	Mean	Max.	Min.
January	2.92	6.17	0.61	3.35	6.46	1.00
February	2.44	4.83	1.18	2.87	5.55	0.93
March	3.38	8.89	1.32	3.66	7.52	1.59
April	3.60	7.62	1.01	3.41	6.49	0.71
May	3.45	6.96	1.17	3.69	6.27	0.70
June	4.00	11.82	0.46	4.46	8.29	1.22
July	4.10	8.00	1.07	4.13	10.14	1.21
August	3.45	9.83	0.79	4.18	20.65	0.46
September	4.25	18.28	0.94	4.12	15.70	1.02
October	3.28	8.05	0.13	3.10	9.12	0.81
November	4.04	7.44	0.95	3.83	8.41	0.83
December	2.96	6.83	0.50	3.33	6.11	0.74
Annual	41.87	61.34	32.81	44.13	62.78	33.51

MEAN MONTHLY SNOWFALL

	Westover Field, Mass.	Hubbardston, Mass.
Elevation (feet msl)	240	1,030
Years of Record	16	25
Month	Snowfall	Snowfall
January	12.7	15.0
February	13.3	14.2
March	10.1	7.6
April	1.6	2.5
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	Trace	0.4
November	2.0	4.2
December	11.3	10.1
Annual	51.0	54.0

c. Transportation Facilities. - (1) State Route 32 passes through Monson, which is located approximately 4 miles south of Massachusetts Turnpike Interchange No. 8. Wales Road which connects Route 32 in South Monson with Route 19 in Wales, passes the project site.

(2) The New York Central Railroad and the Central Vermont Railroad serve the general area.

(3) It will be the responsibility of the contractor to make his own investigation of transportation facilities including railroads and public roads and private lands and make his own arrangements for their use.

SC-6. RATES OF WAGES. - a. The minimum wages to be paid laborers and mechanics on this project, as determined by the Secretary of Labor to be prevailing for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the pertinent locality, are as set forth below.

b. Any class of laborers and mechanics not listed below employed on this contract shall be classified or reclassified conformably to the schedule set out below by mutual agreement between the contractor and class of labor concerned, subject to the prior approval of the Contracting Officer. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question, accompanied by the recommendation of the Contracting Officer, shall be referred to the Secretary of Labor for final determination.

Predetermination No. AC-18,701 dated 2 March 1964 for Conant Brook Dam and Wales Road Relocation involving construction of an earth and rock filled dam with a spillway channel and concrete weir; concrete pipe conduit; construction of a bituminous surfaced road, Monson, Hampden County, Massachusetts.

Classification of Laborers and Mechanics	Minimum Rates of Wages per Hour
Bricklayers	$4.175
Carpenters	3.905
Cement masons	4.175
Ironworkers, structural	4.58
" ornamental	4.58
" reinforcing	4.58
Piledrivermen	4.10
Roofers	3.90
Stonemasons	4.175
Welders - Recieve rate prescribed for craft performing operation to which welding is incidental.	

Apprentice Schedule

Craft	Interval	Period and Rate* 1st	2nd	3rd	4th	5th	6th	7th	8th
Ironworkers	1000 hrs.	60	70	75	80	85	90		
Bricklayers	1000 hrs.	50	55	65	75	85	95		
Carpenters	1000 hrs.	60	65	70	75	80	85	90	95

*The apprentice rate is by percentage of the journeymen's rate unless otherwise indicated.

Classification of Laborers and Mechanics	Minimum Rates of Wages per Hour
HEAVY AND HIGHWAY:	
Laborers	$2.72
Block pavers, Rammers, Curb Setters	3.42
Pipelayers	2.87
Hod Carriers, Pneumatic drill Ops; Jackhammermen	2.97
Blasters and powdermen	3.22
Heavy and Highway Construction:	
Power equipment operators:	
Shovels, crawler and truck cranes, derricks, backhoes, trenching machines, elevating graders, gradall, pile drivers, concrete pavers, draglines, clamshells, cableways	3.95
Rotary drill (with mounted compressor), compressor house (3 to 6 compressors), rock & earth boring machines (excluding McCarthy & similar drills), graders, front end loaders - 4 yard or over - (used as a loader)	3.70
Bulldozers, pushcarts, scrapers (self-propelled or tractor drawn), self-powered asphalt pavers, front end loaders (3/4 yard to 4 yards), mechanics, well drillers, pumpcrete machines, engineers or firemen on high pressure boilers, self-loading batch plants, well point operators	3.50
Hoists, conveyors, self-powered rollers & compactors, power pavement breakers, self-propelled material spreaders, self-powered concrete finishing machines, two bag mixers with skip, front end loaders (under 3/4 yard), McCarthy and similar drills, batch plants (not self-loading), bulk cement plants, engineer in charge of grease trucks containing power greasing equipment, welding machines (3 or more machines)	3.35

Classification of Laborers and Mechanics	Minimum Rates of Wages per Hour
Heavy and Highway Construction	
Power equipment operators (Continued):	
Compressors (one or two, 315 cu. ft. or over), pumps (4" or over), tractors (without blade - drawing sheeps foot, rubber-tired roller, or other type of compactor, including machines for pulverizing or aerating soil)	$3.275
Compressors (up to 315 cu. ft.), small mixers with skip, oilers, pumps (up to 4"), grease trucks, power heaters, welding machines (one or two machines), A-frame trucks, fork-lifts	2.75
Building, Heavy and Highway Construction	
Truck Drivers:	
2-axle trucks	3.00
3-axle trucks	3.05
4 & 5 axle trucks	3.15
low bed trailer, specialized earth moving equipment other than conventional	3.25
Helpers on low beds	3.00

c. Health and Welfare Funds. - The wage rates contained in this decision are straight hourly wage rates. In some areas management and labor organizations in the construction industry have collectively bargained for health and welfare fund contributions. Such contributions are not included in wage rates determined by the Secretary of Labor for construction projects.

d. Payment on Piece-Work Basis. - The payment of employees on a piece-work basis is not, of itself, contrary to the Davis-Bacon Act. However, employers have a contractual and statutory obligation to assure that their employees are paid not less than the amounts due them computed on the basis of the hours worked at the prescribed wage rates for the classification involved, with appropriate overtime payment. Employers must maintain payroll records adequate to ascertain compliance and must submit payrolls showing actual hours worked and actual earnings received each week.

SC-7. VARIATIONS IN ESTIMATED QUANTITIES. - a. Where the quantity of a pay item in this contract which is identified on the Unit Price Schedule with an asterisk, is more than 115% or less than 87% of the estimated quantity stated in this contract, as modified, an equitable

adjustment in the contract price shall be made upon demand of either party. For overruns the equitable adjustment shall be limited to the number of units by which the actual quantity exceeds 115% of the estimated quantities. Where the actual quantity of any pay item is less than 87% of the estimated quantity stated in this contract, the final payment will be computed by applying the contract unit price to that portion of the work actually performed. For the portion of the work between the work actually performed and 87% of the estimated quantity stated in the contract, the contractor shall be paid an equitable negotiated amount that will exclude profit and include only an appropriate amount for mobilization, demobilization and other fixed charges.

b. In order to permit the contractor to distribute his indirect costs properly to Item No. 8, this item has been subdivided into more than two sub-items. All the contractor's indirect costs for this item will be included in the bid price for the first sub-item listed. Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

c. If actual work performed under any item within the scope of Subparagraph a above is more than 105% or less than 96% of the estimated quantity stated in the contract, as modified, and if such variation causes an increase or a decrease in the time required for performance of this contract, the contract completion time will be adjusted as follows:

(1) If the quantity variation is such that it will cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension within 10 days from the beginning of such delay or within such further period of time which the Contracting Officer grants prior to the date of final settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify.

(2) If the quantity variation is such that it will cause a decrease in the time necessary for completion, the Contracting Officer shall ascertain the facts and promptly notify the contractor in writing of his findings and the extent of adjustment.

d. If the parties fail to agree upon the adjustment to be made the dispute shall be determined as provided in Clause 6, "Disputes", of the General Provisions.

SC-8 and SC-9. OMITTED.

SC-10. WATER. - The responsibility shall be upon the contractor to provide and maintain at his own expense an adequate supply of water

for his use for construction and domestic consumption, and to install and maintain necessary supply connections and piping for same, but only at such locations and in such manner as may be approved by the Contracting Officer. Before final acceptance, temporary connections and piping installed by the contractor shall be removed in a manner satisfactory to the Contracting Officer.

SC-11. ELECTRICITY. - All electric current required by the contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer. All temporary lines will be furnished, installed, connected, and maintained by the contractor in a workmanlike manner satisfactory to the Contracting Officer and shall be removed by the contractor in like manner at his expense prior to final acceptance of the construction.

SC-12. OMITTED.

SC-13. LAYOUT OF WORK AND SURVEYS. - a. Layout of Work. - (1) The Government will establish all base lines, and bench marks and horizontal controls at the site of the work.

(2) From the base lines, bench marks, and controls established by the Government, the contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

(3) The contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the base lines and bench marks established by the Government. It shall be the responsibility of the contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed by the contractor or through his negligence prior to their authorized removal they may be replaced by the Contracting Officer, at his discretion, and the expense of replacement will be deducted from any amounts due or to become due the contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the contractor are not reasonably adequate to permit checking the work.

b. Quantity Surveys. - (1) The contractor shall furnish all personnel, equipment and material required to make all original and final surveys to determine the quantities forming the basis of final

payments. Such surveys will be made under the direct supervision of a Government employee who will also record the notes and supervise the computations by contractor personnel. Original copies of survey notes will become the property of the Government.

(2) The contractor shall make such surveys and computations as are necessary to determine the quantities of work performed or placed during each period for which a progress payment is to be made. All original field notes, computations, and other records taken by the contractor for the purpose of progress surveys shall be furnished promptly to the representative of the Contracting Officer and shall be used to the extent necessary in determining the proper amount of progress payments due to the contractor. Unless waived in each specific case, quantity surveys made by the contractor shall be made under the direction of a representative of the Contracting Officer.

c. Costs. - No separate or direct payment will be made to the contractor for performance of surveys for layout of work and determination of quantities and furnishing of notes as specified herein. All such costs of notes, computations, and of layout and survey work performed by the contractor will be considered as incidental to and included in the prices and payments for the items listed in the bid schedule.

d. Verification. - The Government may make checks as the work progresses to verify lines and grades established by the contractor and to determine the conformance of the completed work as it progresses with the requirements of contract specifications and drawings. Such checking by the Contracting Officer or his representative shall not relieve the contractor of his responsibility to perform all work in accordance with the contract drawings and specifications and the lines and grades given therein.

SC-14. PAYMENTS FOR MOBILIZATION. - Payments will not be made under this contract for mobilization.

SC-15. DAMAGE TO WORK. - a. The responsibility for damage to any part of the permanent work shall be as set forth in the article of the contract entitled "Permits and Responsibilities." However, if, in the judgment of the Contracting Officer, any part of the permanent work, except damage to new and permanent work resulting from flooding due to overtopping or other failure of cofferdams as specified in Subparagraph 2-02b, performed by the contractor is damaged by flood, earthquake, hurricane or tornado, which damage is not due to the failure of the contractor to take reasonable precautions or to exercise sound engineering and construction practices in the conduct of the work, the contractor will make the repairs as ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If,

in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such work, equitable adjustment pursuant to Article 3, Changes, of the contract, will be made as full compensation for the repairs of that part of the permanent work for which there are no appliable contract unit or lump sum prices. Except as herein provided, damage to all work (including temporary construction), utilities, materials, equipment and plant shall be repaired to the satisfaction of the Contracting Officer at the contractor's expense, regardless of the cause of such damage.

b. Maintenance of Drainage. - The contractor will be required to maintain adequate drainage through drainage structures and waterways during the life of the contract. When winter weather conditions are such as to cause obstruction of normal drainage ways by accumulations of ice, snow, or a combination of both, suitable approved measures shall be instituted by the contractor and maintained to prevent damage to materials or new or existing work.

SC-16 to SC-23, Inclusive. OMITTED.

SC-24. FUNDS AVAILABLE FOR PAYMENTS. - a. Such work as may be done under this contract in excess of the amount for which funds are available for payment as herein set forth, will be continued with funds hereafter appropriated and allotted for this work.

b. From funds heretofore appropriated by the Public Works Appropriation Act of 1964, the sum of $50,000 is available for payments to the contractor for work performed under this contract.

c. If at any time it becomes apparent to the Contracting Officer that the balance of this allocation is in excess of the amount required to meet all payments due and to become due the contractor because of work performed and to be performed pursuant to his approved progress schedule, the right is reserved after due notice to the contractor to reduce said allocation by the amount of such excess.

d. If the rate of progress of the work is such that it becomes apparent to the Contracting Officer that the balance of this allocation and any allocation for this and any subsequent fiscal years during the period of this contract is less than that required to meet all payments due and to become due the contractor because of work performed or to be performed under this contract, the Contracting Officer may provide additional funds for such payments if there are funds available for such purpose. The contractor will be notified in writing of any additional funds so made available. However, it is distinctly understood and agreed that the amount of funds stated in b. above is the maximum amount the Government insures will be available during the current fiscal year and the Government is in no case liable for payments

to the contractor beyond this amount prior to having notified the contractor in writing of any additional funds that can be made available. Accordingly, no progress schedule will be approved (see Paragraph GC-5(a)) which contemplates progress requiring funds in excess of the amount stated to be available in b. above for the current fiscal year, and no progress schedule will be approved for any ensuing fiscal year which contemplates progress requiring funds in excess of the amount allocated by the Contracting Officer from funds subsequently made available, except as set forth and subject to the conditions in Subparagraph i. below.

e. It is expected that, during subsequent fiscal years over the period of this contract, Congress will make additional appropriations for expenditure on work under this contract. The Contracting Officer will notify the contractor of any additional allocation of funds to this contract when such funds become available. It is understood and agreed that the Government is in no case liable for damages in connection with this contract on account of delay in payments to the contractor due to lack of available funds. Should it become apparent to the Contracting Officer that the available funds will be exhausted before additional funds can be made available, the Contracting Officer will give at least 30 days written notice to the contractor that the work may be suspended. If the contractor so elects, after receipt of such notice, he may continue work under the conditions and restrictions under the specifications, so long as there are funds for inspection and superintendence, with the understanding, however, that no payment will be made for such work unless additional funds shall become available in sufficient amount. When funds again become available, the contractor will be notified accordingly. Should work be thus suspended, additional time for completion will be allowed equal to the period during which work is necessarily so suspended, as determined by the dates specified in the above-mentioned notices.

f. So long as funds are available, payments will be made monthly in accordance with article of the contract entitled "Payments to Contractors". The unit prices or lump-sum price or prices stated in the contract will be used in determining the amount to be paid for work performed by the contractor.

g. The procedure above described will be repeated as often as may be necessary on account of the exhaustion of available funds and the necessity of awaiting the appropriation of additional funds by Congress.

h. Should Congress fail to provide additional funds, the contract may be terminated and considered to be completed, at the option of the contractor, without prejudice to him or liability to the Government, at any time subsequent to 30 days after payments are discontinued, or at any time subsequent to 30 days after the passage of the Act which

would have but did not carry an appropriation for continuing the work or after the adjournment of the Congress which failed to make the necessary appropriations. However, if the funds cited in the contract are enough to extend the work beyond the end of the fiscal year and no new funds are allocated to the contract for the ensuing fiscal year, the contractor must first exhaust all the cited funds and thereafter he may, at his option, exercise the rights provided in this paragraph any time after payments are discontinued.

i. The progress chart prepared in accordance with GC-5(a) will be consistent with the amount of funds stated in Subparagraph b. above, as being currently available for the period of time from the date of contract award to the end of the fiscal year in which the contract was awarded, or at the option of the contractor, the chart may be prepared on the basis of accomplishment of work at a greater rate of progress for the period of time applicable to currently available funds. Any chart initially submitted for approval which contemplates progress at a greater rate than can be paid for with currently available funds will be approved only under the condition that such approval will in no way obligate the Government to make additional funds available for the work. That part of the chart which covers the work for which funds are not currently available will be prepared on the basis of a schedule considered to be practicable by the contractor for accomplishment of the work at such rate of progress as he may desire for completion within the terms of the contract. The progress chart will be revised each time the contractor is notified that additional funds are made available. Each revision will conform with the criteria stated above. With reference to the responsibilities for future funding of the work in accordance with the progress chart, attention is called to the preceding subparagraphs wherein the responsibilities of the Government are set forth for the furnishing of funds for the work. The approval of that part of the schedule covering work for which funds are not currently available will in no way obligate the Government to provide funds to accomplish work at the rate of progress indicated in the schedule.

SC-25 to SC-27, Inclusive. OMITTED.

SC-28. SCHEDULING AND DETERMINATION OF PROGRESS. - a. Independent of partial payments made pursuant to General Provisions 7, "Payments" (Standard Form 23A), progress schedules prepared under the requirements of GC-5, Progress Charts, and Requirements for Overtime Work, shall provide as scheduled progress for only 25 percent of the estimated invoiced cost of materials or equipment delivered to the site but not incorporated in the work as of the time of the scheduled delivery thereof.

b. In determining progress accomplished, the Contracting Officer will allow as an element of work accomplished (progress toward completion) only 25 percent of the invoiced cost of materials or

equipment delivered to the site, but not incorporated in the construction up to the time the materials or equipment are actually incorporated in the work.

SC-29. TIME EXTENSIONS. - Notwithstanding any other provisions of this contract, it is mutually understood that the Government has the right to determine the extent, if any, by which a change in plans or specifications or excusable delays will cause in the completion of various elements of construction. The Contracting Officer may unilaterally provide in a change order that a contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion date(s) for all other portions of the work would not be altered and further provide for an equitable readjustment of liquidated damages, if any, pursuant to the new completion schedule.

SC-30. REVERSE SIGNAL ALARMS - All self-propelled construction equipment, except light service trucks, panels, pickups, station wagons, crawler-type cranes, power shovels and draglines; whether moving alone or in combination shall be equipped with a reverse signal alarm. The alarm shall be mounted on the rear of the equipment and shall be so protected or constructed as to withstand severe wear and tear, adverse weather and unfavorable environmental working conditions and shall be certified by the manufacturer as fully meeting the following performance standards:

The alarm shall produce a relatively pure tone which shall peak within the American Standards Association standard octave passband of 600 to 2400 cycles per second and shall produce a 0.2 to 0.5 second audible warning within the initial three (3) feet of backward movement of the vehicle on which it is mounted and at regular intervals, not to exceed three (3) seconds throughout the backward movement. The alarm shall automatically cut out when backward movement ceases. The sound intensity of the alarm shall range from and not exceed 90-100 db (decibels) at a horizontal distance of 5 feet from the alarm.

Actuation of the alarm shall be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only to the rearward movement of the vehicle with no manual controls of any kind between the source of actuation and the alarm. Where application of this requirement to specific types of equipment has impractical application, other means of actuation may be used upon written approval of the Contracting Officer.

The use of the alarm shall be in addition to prescribed requirements for signalmen.

SC-31 and SC-32. OMITTED.

SC-33. CERTIFICATES OF COMPLIANCE. - Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in three (3) copies. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the date or dates of the tests to which the report applies. Certification shall not be construed as relieving the contractor from furnishing satisfactory material, if, after tests are performed on selected samples, the material is found not to meet the specific requirements.

SC-34 to SC-36, Inclusive. OMITTED.

SC-37. CONTRACT BID BREAKDOWN. - The contractor shall furnish within 10 days after date of award of contract a breakdown of each lump sum bid item. Partial payments will be based on this breakdown. The contractor's breakdown will be reviewed by the Contracting Officer to insure that costs are proportioned properly between early and late pay items. Any unbalanced items or other discrepancies will be revised by the Contracting Officer and the approved breakdown will be utilized as a basis for progress payments to the contractor.

SC-38. TEMPORARY HEAT. - a. All temporary heat required by the contractor in connection with his construction operations shall be furnished or provided by or at the expense of the contractor. Only temporary heating devices having the approval of the Underwriters' Laboratories, Inc., and approved by the Government representative in charge will be used. The contractor will be required to instruct his personnel in the use and operation of these portable type heaters. Such instructions shall be directed to any and all workmen who will have responsibilities connected with the use of such heaters. Instructions will include proper use, handling, location and placement of such heaters when in operation, fire protection provided, hazards connected with the use of such heaters and actions to be taken in case of fire. Portable oil-fired, or gas heaters will be so placed that the heating end will not be directed at combustible material within 10 feet and the unit, itself, shall be at least 2 feet from combustible material.

b. All materials used as tenting for temporary heated enclosures where oil-fired, or gas temporary heaters are used will be of a fire-resistant material. Clear polyethylene plastic material, or similar products will be permitted.

c. No Government-owned heating system will be available for the use of the contractor.

SC-39. OMITTED.

SC-40. SOILS AND MATERIALS CONTROL. - The contractor shall furnish when requested by the Contracting Officer and depending upon the scheduled and actual work operations in progress, two 1/2-ton pickup trucks, the maintenance and operation of which shall be the contractor's responsibility, and shall further provide two laborers depending on the work schedule, approved and qualified as stated below, to aid the Contracting Officer in the sampling and testing of soils, portland cement concrete, bituminous concrete and similar materials. Laborers shall have a high school education or shall have sufficient experience in the sampling and testing of soils and materials so as to attain a reasonable degree of competency in assisting in the performance of field and laboratory tests. Final acceptance by the Contracting Officer will not be made until the laborers have undergone a two-week training period at the New England Division Laboratories in Waltham, Mass. If the laborers furnished are not acceptable, the contractor shall furnish qualified replacements promptly upon request. Laborers found to be acceptable, if used sporadically, may be requested by name by the Contracting Officer and shall be furnished upon request, if still in the employ of the contractor. The personnel and equipment shall be made available within 30 days after receipt of notice to proceed and shall be assigned when needed until no further sampling and testing is required. The personnel and equipment shall be under the supervision and direction of the Contracting Officer and shall be such as to permit sampling and testing to be maintained concurrent with the progress of construction. Sampling and testing will include that necessary to determine that all construction conforms to contract requirements and such other sampling for the project as directed. The Government Area soils and material control laboratory for work under this contract will be located at the Westfield Area Office, Massachusetts State Armory, 137 Franklin Street, Westfield, Mass. The project laboratory will be located in the Storage Building as specified in Section 18. In the event that borrow areas outside the project limits are utilized for any necessary borrow materials, personnel and equipment will be provided to take the samples therefrom. No separate payment will be made for the services of the above equipment and personnel, the costs of which will be considered as a subsidiary obligation of the contractor.

SC-41. CONSTRUCTION SIGN. - The contractor shall furnish and erect a construction sign conforming to the requirements of Drawing No. CON-8, Sheet 27A, 12 ft. x 6 ft., attached at the end of the SPECIAL CONDITIONS. The sign shall be erected at a location selected by the Contracting Officer not later than 15 calendar days after notice to proceed. Upon completion of the work, the sign will remain the property of the contractor. No separate payment will be made for furnishing, erecting and removal of the sign.

SC-42. SAFETY SIGN. - The contractor shall construct a safety sign at a location directed by the Contracting Officer. The sign shall be 3 feet by 6 feet in size and shall conform to the requirements of Drawing No. 40-05-06, Sheet 1 of 1, attached hereto. The sign shall be erected as soon as possible and within 15 calendar days after the date of notice to proceed. The data required by the sign shall be corrected as necessary. No separate payment will be made for erecting and maintaining the safety sign and all costs in connection therewith will be considered a subsidiary obligation of the contractor. The sign will remain the property of the contractor. A previously constructed sign may be reused when satisfactorily reconditioned.

SC-43. ACCIDENT PREVENTION. - a. Contractor's Proposals. - The contractor's proposals for effectuating the requirements of Paragraph GC-16, "Accident Prevention" shall be submitted in quintuplicate to the Resident Engineer as the Contracting Officer's representative.

b. Blasting. - (1) All operations involving the transportation, storage and use of explosives shall be conducted in accordance with applicable laws and the Corps of Engineers' "General Safety Requirements Manual" a copy of which is available for inspection in the office of the Division Engineer and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, Inc.

(2) All vehicles assigned to the daily transportation of explosives and other dangerous articles will be inspected not less frequently than once a week. Vehicles which are occasionally used for this purpose shall be inspected within one week prior to such use.

(3) Inspection shall be performed by competent assigned contractor's personnel other than the operator of the vehicle inspected. Inspection forms will be approved by the Contracting Officer and a completed copy of each inspection will be furnished the Contracting Officer.

(4) Blasting will be permitted only when proper precautions are taken for the protection of all persons, work and property. The contractor shall be liable for all injuries or deaths of persons and all property damage caused by blasting or explosives. The contractor shall provide and keep on the project at all times a radio frequency ammeter or in lieu thereof, a pilot lamp which lights up brightly at 0.06 ampere as recommended in the Institute of Makers of Explosives Pamphlet No. 20, dated 1956, entitled "Radio Frequency Energy a Potential Hazard in the Use and Transportation of Electric Blasting Caps". Tests for radio energy hazards as described in above referenced Pamphlet No. 20 shall be made before loading every round. The contractor or his surety shall, prior to commencement of blasting

operations, make all necessary investigations including inspection of structures near the area of blasting and shall provide such vibration monitoring during blasting operations as may be necessary to assure protection of these structures in conformance with regulatory statutes or directives established by State or other authorities to limit the amount of vibration generated by blasting. These investigations shall be conducted by a qualified vibration engineer and copies of the results of such investigations including test data and records shall be furnished to the Contracting Officer.

c. Outlining Loaded Hole Areas. - The contractor shall be required to clearly outline any loaded hole area, or areas. This may be accomplished by roping off the entire loaded hole area, or by markers of sufficient height, color and spaced so that the entire loaded hole area will be clearly and definitely outlined. The exact method of outlining such areas shall have the prior approval of the Contracting Officer.

d. Handling and Use of Epoxy Resins. - The following precautions shall be taken when epoxy resin systems are specified for painting and similar uses:

(1) Full-face shields shall be provided for and worn by workmen during all mixing, blending and placing operations.

(2) Protective coveralls and neoprene-coated gloves shall be provided for and worn by all workmen engaged in the handling and use of epoxy resins.

(3) Facilities for maintaining personal cleanliness, including showers, washbowls, mild soaps or waterless skin cleansers, clean towels and clean coverall service shall be provided at all times.

(4) Protective creams of a suitable nature for the operation shall be supplied.

(5) Portable eye-washing facilities shall be maintained at mixing and placing operations.

(6) Adequate fire protection shall be maintained at all mixing and placing operations.

(7) Techniques of mixing resin compositions and applying them should be devised to prevent skin contact and minimize vapor exposure. This may be accomplished by:

(a) Mixing the epoxy resin components in a well ventilated hood, or out of doors.

(b) Confining laying-up, coating and curing operations to areas provided with exhaust ventilating facilities.

(c) Protecting with disposable paper bench tops and floor areas which are subject to contamination.

(d) Establishing and vigilantly maintaining meticulous housekeeping standards.

(8) Smoking or the use of spark or flame-producing devices shall be prohibited within 50 feet of mixing and placing operations.

(9) The mixing, placing, or storage of epoxy resin grout, binder or solvent shall be prohibited within 50 feet of any vehicle, equipment, or machinery.

(10) Contaminated clothing which cannot be decontaminated will be burned at an approved burning area at the end of each work day.

(11) Facilities shall be provided for decontamination of clothing and equipment at the job site.

(12) A clean supply of rags or a supply of disposable paper towels shall be supplied daily and discarded in a closed container when used.

(13) Workmen shall be restricted in passing from areas where they are handling epoxy resin to other areas in buildings, without first removing gloves, aprons, and washing hands.

(14) Prior to working with epoxy resins, employees shall receive instructions from the contractor supervisors in the use of epoxy resin systems, and shall be assured that these materials are not highly hazardous when proper precautions are exercised.

e. Communications. - The contractor will be required to provide and maintain a telephone or other means of communication which will be in an easily accessible location at each of the large construction areas on the project where potential fire hazard exists. Such means of communication will be accessible during all work hours.

f. Protective Headgear. - All employees of the contractor and other persons shall wear protective headgear (hard hats) at all times while in the work area(s). These work area(s) shall be all area(s) within the contract work limits.

SC-44 and SC-45. OMITTED.

SC-46. GOVERNMENT FIELD OFFICE. - Contractor shall provide a Field Office for the Government of approximately 200 square feet within fifteen (15) calendar days after receipt by him of notice to proceed. This space may be a separate building or may be partitioned space within the contractor's construction building. Office or space provided shall be weathertight and free from drafts. Windows shall be furnished as necessary to provide adequate natural light. The office shall be equipped with a cylinder lock on the door, a plywood top table approximately 6 ft. by 4 ft., and adequate heating, lighting and ventilating facilities. The contractor shall provide all services and supplies in connection with heating, lighting and maintaining the building. No separate payment will be made for the Government Field Office and all costs shall be included in the various items comprising the detailed bid schedule.

SC-47. IDENTIFICATION OF MECHANIZED EQUIPMENT. - All contractor's machinery, motor vehicles and mechanized equipment as may be required by the Contracting Officer, shall have posted in a conspicuous location on each piece of equipment, acceptable identification showing the owner's name and an identifying number.

SC-48. OMITTED.

SC-49. PROJECT BULLETIN BOARD. - The contractor shall furnish, install, and maintain during the life of the project a weathertight bulletin board approximately 3 ft. high by 5 ft. wide having not less than two hinged or sliding glazed doors with provisions for locking. The bulletin board shall be mounted, where and as approved by the Contracting Officer, in a prominent place accessible to all employees. The bulletin board shall remain the property of the contractor and shall be removed by him upon completion of the contract work. The following information, which will be furnished by the Government to the contractor, shall be posted on the bulletin board and shall be maintained by the contractor in easily readable condition at all times for the duration of the contract.

a. The Equal Employment Opportunity poster and Standard Form 38, "Notice to Labor Unions or Other Organizations of Workers" (when applicable) as required by General Provisions (Standard Form 23A) Clause 21, "Nondiscrimination in Employment".

b. The schedule of minimum wage rates for the contract as required by Labor Standards Provisions (Standard Form 19A) Provision 1, "Davis-Bacon Act", with the minimum wage rate poster (Form SOL-155).

SC-50 and SC-51. OMITTED.

SC-52. DEVIATIONS FROM CONTRACT REQUIREMENTS. - Deviations from contract requirements will not be permitted, except under unusual

circumstances. Submissions of shop drawings and materials will be assumed to be in conformance with plans and specifications, unless they contain an expressed declaration of a deviation, the reasons for it, and request for waiver.

SC-53. CONTRACTOR'S OPTIONS. - The Technical Provisions by specific references permit the contractor to select optional materials, items, systems, or equipment. The use of options is subject to the following conditions:

a. Once an option has been selected and approved, it shall be used for the entire contract.

b. The contractor will be required to coordinate his selection with the plans and specifications and to make all necessary adjustments without additional cost to the Government.

SC-54 and SC-55. OMITTED.

SC-56. APPROVED AGGREGATE SOURCES. - a. Concrete aggregates meeting the quality requirements of these specifications can be produced from the approved commercial sources listed below:

Type	Source
Crushed gravel and processed sand	North Wilbraham Sand and Gravel Co., North Wilbraham, Mass.
Crushed gravel and processed sand	A. Girad and Sons, Inc., Ware, Mass.

b. Concrete aggregates may be furnished from any of the above listed sources or at the option of the contractor may be furnished from any other source designated by the contractor and approved by the Contracting Officer, subject to the conditions hereinafter stated.

c. After the award of the contract, the contractor shall designate in writing only one source or one combination of sources from which he proposes to furnish aggregates. If the contractor proposes to furnish aggregates from a source or from sources not listed above, he may designate only a single source or single combination of sources for aggregates. Samples for acceptance testing shall be provided as required by Section 9 of the TECHNICAL PROVISIONS. If a source for coarse and/or fine aggregate so designated by the contractor is not approved for use by the Contracting Officer, the contractor may not submit for approval other sources but shall furnish the coarse and/or fine aggregate, as the case may be, from an approved source listed above at no additional cost to the Government.

d. Approval of a source of concrete aggregate is not to be construed as approval of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels, when such materials are unsuitable for concrete aggregate as determined by the Contracting Officer. Materials produced from an approved source shall meet all the requirements of Section 9 of the TECHNICAL PROVISIONS of these specifications. Approval of any of the above-listed sources pertains to the quality of raw materials only and does not constitute or imply approval or warranty of the available processing equipment or methods.

SC-57. WARNING SIGNS. - The contractor shall construct, erect, and maintain warning signs at various locations, where directed, along the perimeter of the contractor's work areas. These signs will generally be located where existing roads pass, enter, and approach the work areas. The signs shall be 4 ft. by 2 ft. in size and shall be securely mounted on wood posts provided and installed by the contractor. The signs may be made of 1/2-inch plywood, 3/4-inch dressed stock, not less than 8 inches in width held together with 3/4-inch by 2-inch battens on the rear, or from galvanized sheet metal (16 gage) properly reinforced. After assembly, all surfaces of the sign shall be given not less than two coats of a white exterior type finish paint. If wood is used, the wood shall be primed prior to finish painting. Lettering shall be of proper size for the intended use and shall be done by a sign painter, using quick-drying paint. The following words shall appear on the sign:

DANGER
BLASTING OPERATIONS
TURN OFF ALL 2-WAY RADIOS

Wood signs shall be fastened to wood posts with not less than three 2-inch galvanized wood screws. Metal signs shall be installed in similar manner. The warning signs shall be erected as soon as possible and within 30 calendar days after date of receipt of notice to proceed. No separate payment will be made for erecting all signs and maintaining and removal of the warning signs when the entire work is completed, and all costs in connection therewith will be considered a subsidiary obligation of the contractor.

SC-58. PLANT. - The contractor agrees to keep on the job sufficient plant to meet the requirements of the work. The plant shall be in satisfactory operating condition and capable of safely and efficiently performing the work as set forth in the specifications and the plant shall be subject to inspection by the Contracting Officer at all times.

SC-59. PAYMENT. - Payment for the various items listed in the Unit Price Schedule shall constitute full compensation for furnishing all plant, labor, equipment, appliances, and materials and for performing

all operations required to complete the work in conformity with the drawings and specifications. All costs in connection with work not specifically mentioned shall be included in the lump-sum contract price for the item to which the work pertains.

SC-60. COMMONWEALTH STANDARDS. - a. General. - (1) The Commonwealth of Massachusetts, Department of Public Works, Standard Specifications for Highways and Bridges dated 1953 together with the Amendments and Addenda thereto, dated November 1963 (hereinafter referred to as the Massachusetts Standard Specifications) are incorporated into this contract by reference and shall be the Technical Provisions for the highway work except as otherwise specified in these specifications or indicated on the drawings. Amendments, addenda and revisions to the Massachusetts Standard Specifications issued by the Department of Public Works of the Commonwealth of Massachusetts on or before the date of the Invitation for Bids for this contract to referenced sections shall be considered as a part of the Massachusetts Standard Specifications.

(2) As referenced on the contract drawings and in the specifications, the Commonwealth of Massachusetts, Department of Public Works Construction Standards, dated 1958 (hereinafter referred to as the Massachusetts Construction Standards) are incorporated into this contract as part of the plans.

(3) All references on the drawings and specifications to the Standard Specifications and Construction Standards refer to the Massachusetts Standard Specifications and the Massachusetts Construction Standards, respectively.

b. Definition of Terms. - The Definition of Terms specified in Article 1 of the Massachusetts Standard Specifications are applicable except that the definitions for the following terms are changed as shown:

"Commonwealth"	-	United States Government
"Department"	-	Corps of Engineers, etc.
"Engineer"	-	Contracting Officer, etc.
"Party of the First Part"	-	United States Government
"Proposal"	-	Bid

c. Other. - Articles 2 through 34, inclusive, of Division I of the Massachusetts Standard Specifications are inapplicable except as referenced in Division II. Where Division I conflicts with the requirements of the U. S. Government under the Invitation and Bid Form, Part I, "GENERAL CONDITIONS", PART II, "SPECIAL CONDITIONS", and Standard Form 23, with Standard Form 23A with supplement thereto, or where Division II conflicts, the requirements of the U.S. Government shall govern. Division III is inapplicable.

SC-61. FACTORS AFFECTING THE PROSECUTION OF THE WORK - a. General.- (1) The dam crosses the existing Monson Reservoir which is a water supply reservoir; therefore, no work will be accomplished within the limits of

this reservoir, nor will the existing water supply system be interrupted or disturbed, until the new water supply system has been completed by others and when so directed in writing by the Contracting Officer. The construction of the new water supply system is scheduled to be completed on or about 1 November 1964. In performing any work adjacent to or in the above-mentioned Monson Reservoir, except as specified in Sections, CONTROL AND DIVERSION OF WATER and EXCAVATION, the contractor shall use precautions not to contaminate the water in the reservoir.

(2) When the new water supply system has been completed, the contractor, in order to divert the brook through the outlet works and in order to construct the diversion cofferdams and perform work in the dam foundation and place fills in the dry, will contact the town officials to obtain persmission to lower the water in the Monson Reservoir.

(3) Wales Road shall be kept open at all times for traffic until the relocated Wales Road has been substantially completed. Electric and telephone lines along Wales Road will be removed and relocated by others.

(4) The existing 12-inch water supply pipe shall not be disturbed until permission is granted in writing by the Contracting Officer.

b. Dam and Appurtenant Structures. - Until the new water supply system by others, and the relocation of Wales Road have been substantially completed, the contractor will be permitted to perform only the following operations in the construction area for the dam and appurtenant structures:

(1) Clearing, grubbing and stripping of the dam foundation, except as noted in Subparagraph SC-61a. above.

(2) Clearing and grubbing of Parts 1 and 2 of the Borrow Area.

(3) Excavation of the foundation cut-off trench between Sta. 1/25 and approximate Sta. 5/50. Excavation of the foundation drain trench between Sta. 2/25 and approximately Sta. 6/00.

(4) Construct the outlet works, except as noted in Subparagraph SC-61a. above.

(5) Excavation of Spillway Channel, except as noted in Subparagraph SC-61a. above.

(6) Initiate the foundation grouting.

(7) Construction of access road to subgrade for base course.

c. Dike. - The dike shall be completed as soon as possible during the first construction period. Munn and Sutcliffe Roads shall be kept open at all times for traffic.

d. Barricades and Signs. - The contractor shall provide, erect and maintain all necessary barricades, suitable and sufficient red lights, bomb lights, reflectorized signs or signals, danger signals and signs, provide a sufficient number of policemen, watchmen and take all necessary precautions for the protection of the work and safety of the public. All applicable requirements of Articles 51, 52, and 53 of the Massachusetts Standard Specifications shall apply. Commencement of construction shall be contingent upon the prior installation of adequate signs, barricades, warning, etc., in the area concerned. Streets and highways closed to traffic shall be protected by effective barricades on which shall be placed acceptable reflectorized warning signs, lights and signals. The contractor shall provide and maintain, throughout the project, acceptable warning, direction and detour signs at all closures, intersections and along the construction and detour routes directing the traffic around the closed portion or portions of the streets and highways so that the temporary detour route or routes shall be indicated clearly throughout its or their entire length. All barricades, obstructions, warnings and signs shall be either reflectorized or lighted at night. All lights shall be kept burning from sunset to sunrise. All the aforesaid protective devices shall be in strict conformity with the plans and shall be as directed by the Contracting Officer. When construction is suspended for any reason, the barricades, warning and detour signs shall be established on a semi-permanent basis and shall be reflectorized. Installation and arrangement shall be approved by the Contracting Officer, and shall be designed to provide safe driving conditions on a basis equal to that of the rest of the traveled way which is not under construction. The contractor shall not receive additional compensation for the control of traffic, the furnishing, installation, maintenance and removal of lights, barricades, direction signs, warning and detour signs, reflectorization, etc., but the cost thereof shall be included in the unit prices bid for the items involved in the construction for the highway relocations and improvements. In the event that the contractor neglects to satisfactorily install and maintain barricades, warning and detour signs, the Contracting Officer may proceed to have such installations made, and the cost thereof shall be deducted from the monies due or to become due the contractor.

e. Existing Utilities. - (1) Existing utility and drainage lines that are shown on the drawings or the locations of which are made known to the contractor prior to excavation and that are to be retained, as well as utility and drainge lines and culverts constructed during excavation operations, shall be protected from damage during excavation

and backfilling, and if damaged, shall be satisfactorily repaired by the contractor at no additional cost to the Government. In the event that the contractor damages any existing utility lines that are not shown on the drawings or the locations of which are not known to the contractor, report thereof shall be made immediately to the Contracting Officer. If the Contracting Officer determines that repairs shall be made by the contractor, such repairs will be ordered under the clause of the General Provisions on the contract entitled CHANGED CONDITIONS. When utility lines that are to be removed are encountered within the area of operations, the contractor shall notify the Contracting Officer in ample time for the necessary measures to be taken to prevent interruption of the service.

(2) The contractor shall ascertain the exact location and elevations of the Tennessee Gas Company lines by hand excavated pits or other means prior to construction operations in the areas where these lines cross the new work. Proper precautions shall be taken to protect these lines at all times.

f. Existing Trees. - To the extent possible, the contractor shall save and protect all existing trees and shrubs on existing lawns, except those noted to be removed.

g. The contractor shall maintain and repair at his own expense those portions of existing paved and unpaved roads, bridges, and grassed areas which he, by necessity, damages or uses as access to the construction areas and for handling of materials during construction operations. The contractor shall also provide all necessary traffic control. At the contract completion, these roads, bridges and grassed areas shall be repaired and restored to match existing condition prior to use by the contractor.

SC-62. DEFINITION OF "SITE OF THE WORK" FOR PURPOSES OF THE PROVISIONS OF THE DAVIS-BACON ACT, 40 U.S.C. 276a. - The Comptroller General of the United States, in Decision B-148076 dated 26 July 1963, issued an opinion which conflicts with the long established ruling of the Solicitor of Labor defining the "site of the work."

Pending resolution of this difference, the Department of Defense position is to follow the ruling of the Solicitor of Labor that the "site of the work" refers to the site of the contract work and includes not only the limited physical area where the structure or improvement is erected or built but also certain other operations set up exclusively to furnish materials for the construction project. Accordingly, wages paid in connection with such operations shall be not less than the minimum wage rates, with appropriate adjustment for overtime hours, established by the Secretary of Labor and included in the contract. The contractor must maintain complete payroll records for all employees working at these temporary facilities and must submit to the Contracting Officer weekly payrolls for said employees.

The tests to be used in determining whether such a facility is within the coverage of the Act are basically:

(1) whether the facility is temporary and established virtually exclusively to meet the needs of the contract, or a series of contracts on an integrated project, rather than to serve the public generally; (2) whether the facility is located in the general area of the construction; and (3) whether the facility is integrated with the construction needs.

Any failure of the contractor to comply with the above may, pursuant to Clauses 6 and 7 of the Labor Standards Provisions (Standard Form 19-A), result in the Government terminating the contract or withholding from the contract amount funds necessary to assure proper wage payment.

SC-63. NON-DISCRIMINATION CLAUSE -- COMPLIANCE REPORTS. - a. In general, prime contractors holding construction contracts for $100,000.00 or more and subcontractors holding subcontracts for $50,000.00 or more must file compliance reports on Standard Forms 40, 40-A, and/or 41 in accordance with the instructions set forth on the reverse side of the form. Exemptions are also indicated on the form.

b. Prior to award of any subcontract regardless of amount the contractor will furnish to the Contracting Officer a representation, similar to that furnished by the contractor at the time of bidding, signed by the proposed subcontractor indicating submission of required compliance reports.

c. In addition to the furnishing of the subcontractor's representation concerning submission of required compliance reports, the contractor shall, prior to award of any subcontract, furnish the Contracting Officer with the following information:

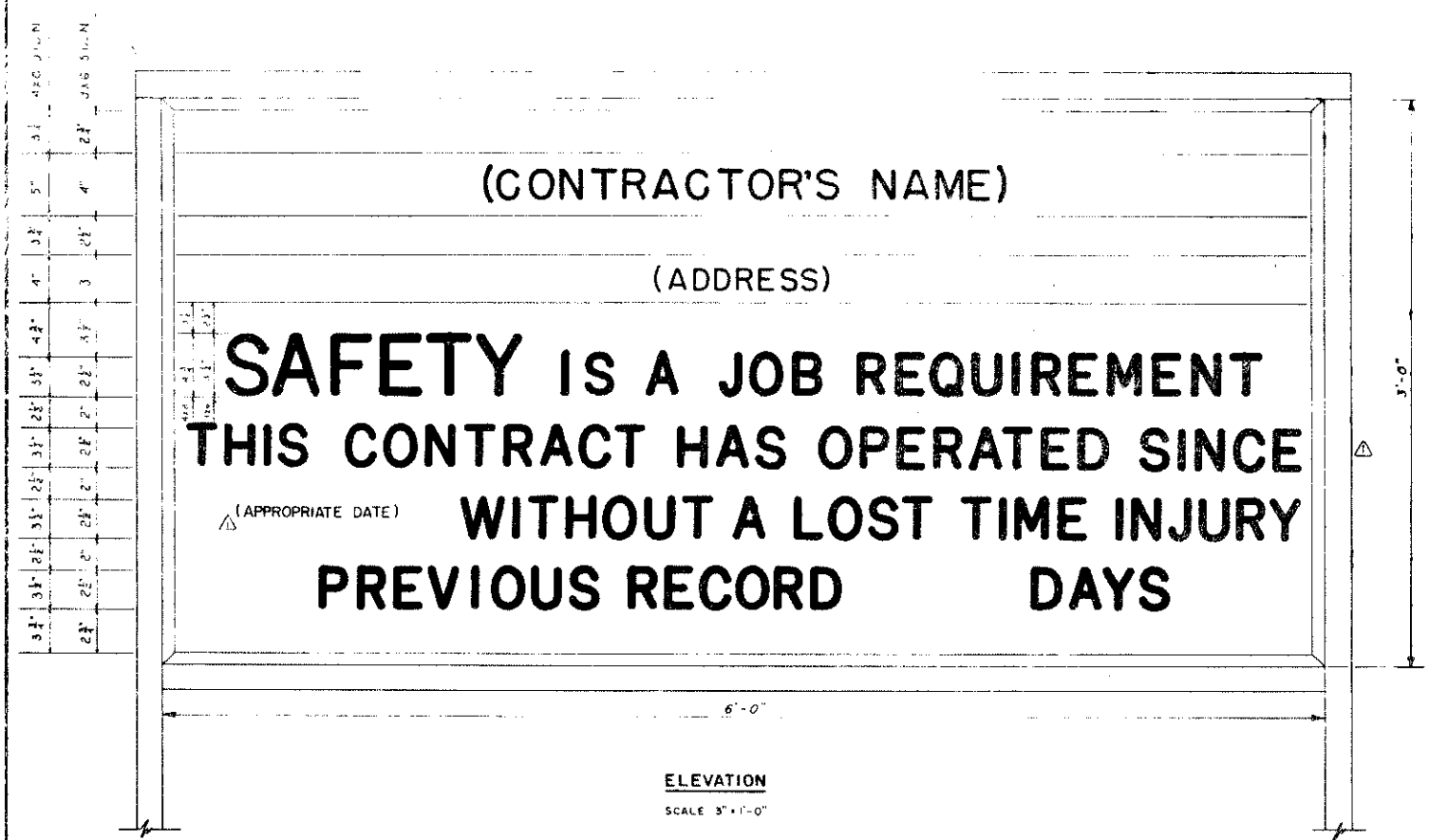
(1) Name and address of the subcontractor.

(2) Nature of proposed subcontract work.

(3) Whether the subcontract value is more than $10,000.00 but less than $50,000.00, or more than $50,000.00.

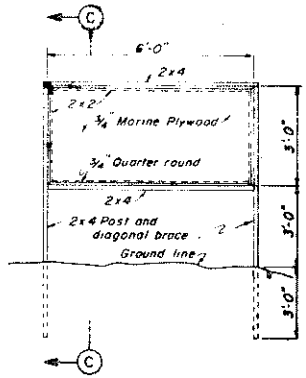
d. "Subcontract" for the purposes of the non-discrimination clause means any agreement made or purchase order executed by a prime contractor or a subcontractor where a material part of the supplies or services covered by such agreement or purchase order is being obtained for use in the performance of a contract, except that in the case of construction work at the site of construction the term subcontract shall apply regardless of tier.

CORPS OF ENGINEERS U. S. ARMY

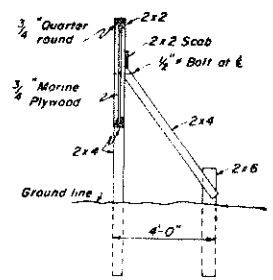


ELEVATION

SCALE 3" = 1'-0"



ELEVATION



SECTION C-C

3' x 6' SIGN

(4' x 8' SIGN SIMILAR)

NOTE:

This elevation is of a 3' x 6' Sign See specifications for size required under this contract.

⚠ SPECIFICATIONS

1. Posts, rails and bracing shall be No.1 yellow pine or approved equal S4S-Fed. Spec. MM-L-751c.

2. All exposed surfaces, including edges, shall be given one coat of linseed oil and wiped prior to primer coat, one coat of exterior lead and oil primer conforming to Fed. Spec. TT-P-25a, and two finish coats of white exterior paint conforming to Fed. Spec. TT-P-104.

3. Black lettering paint shall be Kem Bulletin Color C20 Bl as manufactured by Sherwin-Williams Co., or approved equal.

4. Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.

REVISION	DATE	DESCRIPTION	BY
⚠	4-11-57	Sign information and specifications revised.	

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON, MASS

DES BY	DR BY	CK BY
C.H.P.	W.B.	

CHIEF DESIGN BRANCH

PROJECT ENGINEER

SUBMITTED BY

CHIEF MILITARY BRANCH

APPROVED

CHIEF ENGINEERING DIV

APPROVED

COL. C.E. FOR THE DIVISION ENGINEER

DATE JULY 1955

SAFETY SIGN

SCALE AS SHOWN | SPEC NO

DRAWING NUMBER 40-05-06

SHEET 1 OF 1

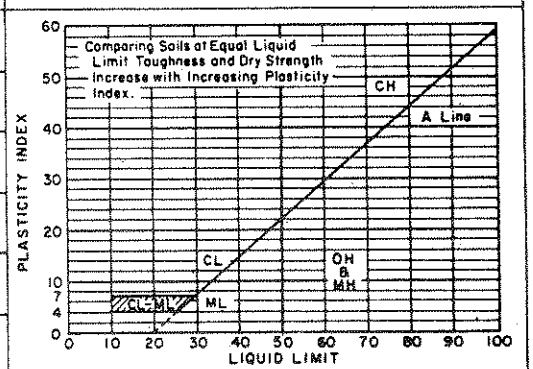
⚠

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

Major Divisions			Group Symbols	Typical Names	Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weight).			Laboratory Classification Criteria
Coarse-grained Soils: More than half of material is larger than No. 200 sieve size.	Gravels: More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Gravels (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.			$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
			GP	Poorly graded gravels, or gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			Not meeting all gradation requirements for GW
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).			Atterberg limits below "A" line with PI less than 4
			GC	Clayey gravels, gravel-sand-clay mixture.	Plastic fines (for identification procedures see CL below).			Atterberg limits above "A" line with PI greater than 7
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size)	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.			Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
			SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.			$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).			Not meeting all gradation requirements for SW
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).			Atterberg limits above "A" line or PI less than 4
								Atterberg limits above "A" line with PI greater than 7
								Limits plotting in hatched zone with PI between 4 and 7 are borderline cases requiring use of dual symbols.
					Identification Procedures on Fraction Smaller than No. 40 Sieve Size			
					Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)	
Fine-grained Soils: More than half of material is smaller than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	Silts and Clays: Liquid limit is less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None	
			CL	Inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium	
			OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight	
	Silts and Clays: Liquid limit is greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium	
			CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High	
			OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to Medium	
Highly Organic Soils			PT	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.			

Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows:

Less than 5%: GW, GP, SW, SP.
More than 12%: GM, GC, SM, SC.
5% to 12%: Borderline cases requiring use of dual symbols.



PLASTICITY CHART
For laboratory classification of fine-grained soils

(1) Boundry classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder.
(2) All sieve sizes on this chart are U. S. standard.

NOTE

For further information on Unified Soil Classification, refer to "The Unified Soil Classification System," Volumes 1 and 2, Technical Memorandum No. 3-357, published by U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. File copies may be examined at Headquarters, U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Massachusetts., Building 141, Foundation and Materials Branch.

Adopted by Corps of Engineers and Bureau of Reclamation, January 1952

NEDGL 61-50

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.
FD-1	689.4	J-5	5.0-10.0	SM	9	50	41		17	14											
		J-7	10.0-13.8	GM	44	37	19	0.021	NonPlastic												
		J-11	20.0-22.2	SP-SM	8	82	10														
		J-14	25.7-27.0	SM	31	53	16														
FD-2	787±	J-5	5.0-10.0	SM	7	64	29														
		J-7	15.0-17.0	SM	8	64	28														
		J-9	20.0-21.2	SM	21	50	29		NonPlastic			7.9									
		J-13	30.0-31.6	SM	3	60	37	0.006				7.8									
		J-15	35.0-36.0	SM	4	60	36	0.01													
FD-3	745.0	J-4	5.0-10.0	SM	9	58	33	0.008				11.0									
		J-9	19.0-20.0	SM-SC	14	46	40	0.0016	19	13											
		J-16	35.0-36.0	SC	31	35	34	0.0016	21	13		9.3									
FD-4	730±	B-7	5.0- 7.3	SP-SM	4	87	9	0.088													
FD-6	689.7	J-3	3.2- 5.0	GP-GM	48	44	8	0.09													
		J-4	5.0-10.0	GM	44	42	14	0.044													
		J-7	15.0-20.0	SM	29	48	23	0.012													
		J-9	25.0-29.2	ML	0	7	93	0.018	NonPlastic												
		J-10	29.8-34.0	ML	0	2	98	0.01													
		J-13	36.6-39.2	SM	7	79	14	0.054													
FD-7	690.0	J-6	10.0-15.0	GP-GM	48	45	7	0.13													
		J-7	15.0-20.0	GP-GM	55	38	7	0.11													
		J-10	23.0-25.0	GP-GM	50	43	7	0.13													
		J-11	25.0-29.2	GP-GM	60	29	11	0.052													
		J-13	30.0-32.6	ML	0	1	99	0.0081													
		J-16	35.0-37.7	GM	58	24	18	0.032													

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.
FD-8	709.8	J-3	5.0-10.0	SM	19	41	40	0.003													
		J-4	10.0-15.0	SM	11	46	43	<0.001				10.1					134.7	(Plug Sample)			
		J-7	25.0-27.0	SM	11	60	29	0.013				7.1					144.0	(Plug Sample)			
FD-9	704.9	J-5	10.0-13.1	ML-CL	5	26	69	0.001													
		J-6	13.1-15.0	SM-SC	10	44	46	<0.001				9.4					137.6	(Plug Sample)			
FD-10	712.9	J-4	5.0-10.0	SM	10	57	33	0.006													
		J-5R	5.0-10.0	SM	4	62	34	0.005				10.0					133.0	(Plug Sample)			
		J-8	15.0-20.0	SM	10	61	29	0.01													
		J-14	25.0-30.0	SM	13	53	34	0.0095													
		J-20	35.0-38.0	SM	7	59	34	0.007													
		J-23R	38.0-39.3	SM	7	55	38	0.005				13.0					138.0	(Plug Sample)			
FD-10A	712.9	Extension of FD-10																			
		J-3	40.5-41.0	SM	17	55	28	0.0095													
		J-5	50.0-51.5	SM	13	55	32	0.003													
		J-8	60.0-61.3	SM	27	50	23	0.02													
FD-11	697.6	J-4R	5.0-10.0	SM	19	68	13														
FD-12	688.4	J-3	2.8- 5.0	GP	63	33	4	0.24													
		J-6	8.5-10.0	GP	64	33	3	0.34													
		J-8	13.5-15.0	SP-SM	38	57	5	0.18													
		J-10R	15.0-17.2	SM	11	64	25	0.016													
		J-12	20.7-23.4	SM	19	55	26	0.015													
FD-13	688.2	J-4	4.1- 5.0	GP	48	47	5	0.18													
		J-5	5.0- 5.8	SM	0	94	6	0.09													
		J-7	6.7- 8.6	SM	19	55	26	0.015													

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-14	707.1	J-1	1.2- 4.1	SM	0	63	37															
		J-3	5.0- 6.7	SP-SM	24	64	12															
		J-4	6.7- 8.1	SM	27	57	16	0.042														
FD-15	695.6	J-2	1.6- 4.7	GP-GM	57	36	7	0.10														
FD-17	764.5	J-4	2.5- 5.0	SM	31	51	18															
		J-5	5.0- 8.0	SM	19	63	18															
FD-18	746.3	J-2	2.3- 4.2	SM	32	51	17															
FD-19	695.2	J-2	2.1- 5.0	SP-SM	30	58	12															
		J-4	6.2-10.0	SM	19	51	30	0.0071														
		J-6	10.0-15.0	SM	18	66	16															
		J-8	16.0-17.8	SM	22	64	14	0.051														
		J-9	17.8-20.0	GP-GM	45	45	10	0.074														
		J-13	29.0-30.8	SM	33	49	18	0.029														
FD-20	725.1	J-3	2.1- 4.9	GP-GM	53	40	7	0.10														
FD-21	727.6	J-3	2.4- 5.0	SM	31	50	19															
FD-22	770.2	J-2	0.8- 4.9	GM	46	39	15															
FD-23	698.2	J-6	10.0-15.0	SM	11	56	33	0.01														
		J-10	20.0-22.7	SP-SM	16	78	6	0.12														
		J-13	25.0-27.4	SM	19	69	12															
		J-24	37.4-39.5	ML	11	24	65	0.013														
		J-32	48.9-50.0	SM	6	78	16															
FD-24	764.4	J-3	5.0-10.0	GM	40	39	21	0.028														

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO		* PVD LBS/CU FT	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	- NO 4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT		TOTAL	- NO 4	SHEAR	CONSOL.	PERM.	
FD-25	764.2	J-3	2.1- 5.0	SP-SM	45	47	8	0.15														
FD-26	759.9	J-3	2.5- 4.0	SP-SM	20	68	12															
		J-6	8.5-10.5	SM	37	36	27	0.02														
FD-27	720.6	J-4	5.0- 6.2	SM	15	57	28	0.014														
		J-7	10.0-15.0	ML-CL	10	39	51	< 0.001														
		J-11	18.0-20.0	SM	19	39	42	0.0029														
		J-15	23.0-24.6	SM	10	50	40	0.001														
		J-23	30.7-32.2	SM	23	48	29	0.011														
		J-28	34.5-37.0	SM	14	61	25	0.02														
		J-33	40.0-42.0	SM	6	62	32	0.013														
FD-28	760.3	J-2	0.7- 5.0	SP-SM	25	68	7	0.10														
FD-29	761.4	J-3	2.2- 5.0	GP-GM	52	41	7	0.14														
FD-30	763.5	J-3	5.0- 7.5	GM	52	32	16															
FD-31	721.5	J-5	6.1-10.0	SM	6	54	40	0.0048														
		J-8R	10.0-15.0	SM								10.6	11.7				131.4	(Plug Sample)				
		J-12	20.0-23.0	SM	10	62	28	0.019														
		J-14	23.0-25.0	SM	4	62	34	0.008														
		J-16	25.0-27.0	SM	5	58	37	0.006				6.3	6.7				145.0	(Plug Sample)				
		J-26R	35.0-35.9	SM	14	53	33	0.011														
		J-30	42.0-44.3	SM	19	52	29	0.014														
		J-44	57.3-58.6	SM	11	54	35	0.0039														
FD-32	771.4	J-2	0.9- 4.5	SM	33	42	25															

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS - GRAVEL %	SAND %	FINES %	D_{10} m.m.	ATT. LIMITS LL	PL	SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT TOTAL	- NO4	COMPACTION DATA STND. AASHO OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	NAT. DRY DENSITY LBS/CU FT TOTAL	- NO4	OTHER TESTS SHEAR	CONSOL.	PERM.	
FD-33	752.5	J-1	0.9- 5.0	SM	11	72	17															
FD-34	741.7	J-3	2.5- 5.0	ML	0	31	69	0.01														
FD-35	715.2	J-5	5.0-10.0	SM	13	67	20															
		J-6	10.0-12.0	GP-GM	48	43	9	0.08														
FD-37	691.8	J-3	5.5-10.0	SM	14	55	31	0.012														
		J-6	15.0-18.0	SP	47	48	5	0.20														
FD-38	763.9	J-4	3.3- 5.0	SP-SM	3	85	12															
		J-8	7.8-10.0	SM	20	38	42	0.025														
		J-13R	15.0-17.5	SP-SM	29	64	7	0.091														
FD-39	754.5	J-4	6.0- 9.6	GP	50	47	3	0.17														
		J-6	12.5-15.0	SP-SM	0	94	6	0.10														
		J-8	17.0-20.0	SP	8	89	3	0.14														
FD-40	753.6	J-6	7.5-13.0	SP-SM	0	94	6	0.083														
		J-11	15.0-20.0	SP	34	61	5	0.16														
		J-14	22.0-24.1	SP-SM	3	89	8	0.09														
FD-45	699.5	J-4	5.0-10.0	SM-SC	10	57	33	0.01														
		J-6	10.5-15.0	SM	19	52	29	0.009														
		J-12	25.0-30.0	SM-SC	12	54	34	0.0031														
		J-16	35.0-40.0	SM	18	56	26	0.013														
FD-47	699.8	J-3	5.5-10.0	SM	12	64	24	0.025														
		J-7	15.0-18.0	SM	14	56	30	0.018														
		J-11	20.0-23.0	SP-SM	23	68	9	0.10														

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CUFT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-50	709.6	J-3	2.0- 5.0	SM	20	44	36	0.0051														
		J-8	15.0-20.0	SM	18	54	28	0.013														
		J-14	30.0-35.0	SM	22	53	25	0.015														
		J-20	50.0-53.0	SM	14	59	27	0.012														
FD-55	642.9	J-2	1.8- 4.3	SM	16	61	23	0.03														
		J-5	7.6- 9.4	SM	4	59	37	0.007														
		J-9	12.1-15.0	SM	11	53	36	0.01														
		J-11	17.6-19.1	SM	37	50	13	0.05														
FD-56	638.8	J-1	0.7- 2.8	SP-SM	59	36	5	0.18														
		J-4	6.2-10.0	SM	13	58	29	0.015														
		J-8	15.7-18.9	GM	48	34	18	0.035														
FD-57	637.2	J-4	10.0-15.0	SM	19	60	21	0.022														
		J-5	15.0-18.2	SW	20	75	5	0.16														
FD-58	636.9	J-4	5.0-10.0	SM	13	62	25	0.013														
		J-7	12.9-15.0	SM	11	69	20	0.035														
FD-59	743.7	J-2	5.0- 7.4	GP-GM	45	45	10	0.08														
		J-4	10.0-13.4	ML	0	6	94	0.007														

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	- NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL.	PERM.	
FT-1	752±	B-3	2.9-16.4	SM	0	87	13															
FT-2	766.3	B-2	2.2- 6.0	SM	33	41	26															
FT-3	771.4	B-3	4.4- 6.0	ML	5	32	63															

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
BD-1	819.6	J-6	6.7-10.0	SM	12	62	26	0.024														
		J-7	10.4-11.8	SM	6	62	32	0.016														
		J-8R	10.4-11.8	SM								9.2	9.9									
		J-13	15.0-17.0	SM	10	58	32	0.011														
		J-14R	15.0-17.0	SM								9.6	9.9									
		J-19R	20.0-22.0	SM	7	62	31	0.015				8.4	8.6									
		J-23	25.0-27.4	SM	6	57	37	0.008														
		J-24R	25.0-27.4	SM								9.2	10.7									
BD-2	803.6	J-2	1.6- 4.2	SM	26	57	17															
		J-5	5.0- 8.8	SM	18	55	27	0.03														
		J-7	10.0-13.0	SM	23	58	19	0.04														
		J-9	13.0-15.0	SM	7	62	31	0.017														
		J-10R	13.0-15.0	SM								9.5	11.1									pH
		J-16	21.0-22.3	SM	17	56	27	0.02														
		J-20	26.0-27.6	SM	11	50	29	0.015														
		J-21R	26.0-27.6	SM								11.8	13.1									
		J-25	35.0-38.0	SM	7	61	32	0.014														
		J-26R	35.0-38.0	SM								10.3	12.3									
		J-33	45.0-46.4	SM	12	65	23	0.026														
		J-34R	45.0-46.4	SM								8.8	9.8									
BD-3	818.0	J-3	5.0- 6.0	SM	6	72	22	0.05														
		J-8	11.7-13.7	SM	6	63	31	0.017														
		J-9R	11.7-13.7	SM								8.8	8.9									
		J-15R	19.7-20.5	SM	6	57	37	0.008	NonPlastic													pH
		J-19	26.0-27.1	SM	6	65	29	0.019														
		J-20R	26.0-27.1	SM								10.7	11.0									
		J-22	31.0-32.5	SM	9	60	31	0.009	NonPlastic													
		J-28	40.0-42.0	SM	11	73	26	0.029														
		J-29R	40.0-42.0	SM								9.2	9.4									

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} MM.	LL	PL		TOTAL	- NO 4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	- NO 4	SHEAR	CONSOL.	PERM.
BD-4	815.3	J-5R	2.1- 3.0	SM	13	57	30														
		J-9	10.0-12.2	SM	32	53	15														
BD-5	846.5	J-4	5.0- 6.4	SM	8	62	30														
BD-6	839.3	J-3	3.5- 5.0	SM	19	60	21	0.031													
		J-7R	7.6-10.0	SM								8.1	8.6								
		J-8	10.0-12.0	SM	5	61	34	0.01													
		J-10	15.0-17.0	SM	13	54	33	0.002													
		J-11R	15.0-17.0									7.5	7.8								
BD-7	819.8	J-4	5.0-10.0	SM	20	59	21	0.03													
		J-5R	5.0-10.0	SM								7.3	8.2								
		J-9	15.0-17.0	SM	6	58	36	0.007													
		J-10R	15.0-17.0	SM								7.7	8.5								
		J-13	25.0-26.4	SM	7	62	31	0.015													
		J-14R	25.0-26.4	SM								9.3	10.1								
		J-17R	30.0-33.0	SM								9.5	9.8								
		J-20	40.0-42.3	SM	3	61	36	0.004				7.5	7.9								
BD-8	828.6	J-6	5.5- 8.0	SM	7	59	34	0.008													
		J-7R	5.5- 8.0	SM								9.8	10.3								
		J-12	15.0-16.3	SM	3	58	39	0.006													
		J-13R	15.0-16.3	SM								12.1	13.3								

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
BD-9	790±	J-3R	1.8- 5.0	SW-SM	13	76	11	0.068														
		J-5R	5.0- 9.0	SM	14	72	14	0.058														
		J-7R	10.0-12.4	SM	15	59	26	0.03														
		J-8R	10.0-12.4	SM								6.7	9.9									
		J-12	15.0-16.0	SM	7	63	30	0.012														
		J-13R	15.0-16.0	SM								9.2	10.1									
		J-16	25.0-27.0	SM	8	61	31	0.011														
		J-19R	30.0-32.0	SM								9.4	9.6									
		J-22	40.0-43.0	SM	9	62	29	0.017														
		J-23R	40.0-43.0	SM								7.2	7.5									

Page 4 of 11

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT BROOK DAM

SOIL TESTS RESULTS

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO		* PVD LBS/CU FT	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT		TOTAL	-NO4	SHEAR	CONSOL.	PERM.
BTT-1	830.0	J-3R	3.1- 6.6									11.7	13.0								
		J-3R	3.1- 6.6									11.5	12.8								
		B-4	3.1- 6.6	SM	9	62	29	0.016	NonPlastic					10.5	125.8						x
		UC-5A	3.1- 6.6									9.8					126.5				
		UC-5B	3.1- 6.6									11.2					122.8				
		UC-5C	3.1- 6.6									10.9					122.1				
		J-6R	6.6-11.0									12.1	13.6								
		J-6R	6.6-11.0									11.4	13.6								
		B-7	6.6-11.0	SM	17	64	19	0.041	NonPlastic		2.74			9.8	119.4				x		x
		J-8R	11.0-15.5									10.3	11.1								
		J-8R	11.0-15.5									10.8	11.4								
		B-10	11.0-15.5	SM	9	62	29	0.018	NonPlastic		2.75			10.5	123.7				x	x	
		UC-9A	11.0-15.5									11.4					129.9				
		UC-9B	11.0-15.5									8.3					139.8				
		UC-9C	11.0-15.5									8.6					138.5				

NED FORM JUL 63 510

* PROVIDENCE VIBRATED DENSITY TEST

CONANT-BROOK DAM

SECTION 1

PREPARATION OF SITE
(Item 1)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
1-01	Scope	1-1
1-02	Removal of Existing Structures	1-1
	a. General	1-1
	b. Removal of C.I, Water Pipe	1-2
	c. Disposal	1-2
1-03	Clearing and Grubbing	1-2
	a. General	1-2
	b. Clearing	1-2
	c. Grubbing	1-3
	d. Disposal	1-3
1-04	Lowering Water Service	1-3
1-05	Plugging the Existing Water Main	1-4
1-06	Removal of Debris from Existing Culverts	1-4
1-07	Payment	1-4

SECTION 1

PREPARATION OF SITE

(Item 1)

1-01. SCOPE. - Work covered by this section of the specifications consists in furnishing all plant, labor, equipment, and appliances and in performing all operations in connection with the clearing and gubbbing, and structure removal at various sites of the work, including the dam, dike, and the highway relocations and improvements, except the borrow area, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

1-02. REMOVAL OF EXISTING STRUCTURES. - a. General. - Within the limits of clearing and except as specifically covered under other sections, the contractor shall remove all structures, wood and wire fences, aboveground stone walls and rock piles, and existing underground piping, culverts, utilities, and appurtenant structures. Beyond the limits of clearing, the contractor shall remove the structures over the two indicated water supply wells to be abandoned, shall seal and plug the open pipe ends with concrete, shall fill the wells, and shall remove portions of the existing cast iron water line to the limits hereinafter specified. The contractor shall, as hereinafter specified, fill all cellars, basements, cisterns, wells, etc., and shall backfill all excavations due to the removal of underground pipes, utilities, and structures.

(1) The term "structures" shall include buildings, or portions thereof, walls, septic tanks, leaching cesspools, cellars, wells, etc. Structures shall be removed or filled to ground surfaces, as applicable, except that in areas to be graded or topsoiled and seeded, concrete and masonry shall be removed to at least 12 inches below finished grade.

(2) All existing septic tanks, leaching cesspools, underground storage tanks, etc., within the limits of clearing shall be removed and resulting holes filled, as specified below. The contractor shall investigate and determine if any such items are required to be removed.

(3) All fills and backfills as required due to removal of existing structures occurring within limits of foundation fill areas shall consist of material similar to adjacent embankment fill material, and all costs in connection with excavation, filling and backfilling will be paid for in accordance with the applicable earthwork sections of the Technical Provisions.

(4) All fills and backfills as required due to removal of existing structures and occurring outside the limits of foundation fill areas shall be accomplished using suitable approved material including broken concrete and masonry, well compacted so that little settlement will result, and top earth fill so graded so that final finished grades will be continuous with adjacent contours of the general terrain.

b. Removal of C.I. Water Pipe. - The contractor shall be required to remove the existing 12-inch cast iron water main beneath the dam embankment and to a distance of approximately 10 feet beyond the toes of the dam. Since the exact location and depth of the pipe is not definite, the contractor shall not commence any removal operations until he has excavated the foundation cut-off and drainage trenches and has clearly located the pipe and determined its line and grade. Excavation for pipe removal shall not begin until excavation for the dam embankment foundation in the above area has been completed. Within other areas, the pipe need not be removed; however, all open ends shall be securely sealed and plugged with concrete to a minimum depth of 12 inches or with approved type plugs.

c. Disposal. - The structures and other items removed shall become the property of the contractor. Combustible material shall be disposed of as specified in Paragraph 1-03d. "Disposal". Non-combustible materials not suitable or permitted for use as fill shall be wasted in off-site contractors disposal areas.

1-03. CLEARING AND GRUBBING. - a. General. - Clearing shall consist of the satisfactory felling and removal of all trees and vegetation (except grass) together with down timber, snags, brush and rubbish and other objectionable material and vegetation other than grass and leaves from the areas specified, and occurring within the limits of the areas to be cleared. Grubbing shall consist of the below ground removal and disposal of all stumps, natural growth, and buried logs, from areas specified.

b. Clearing. - The areas to be cleared shall include all existing uncleared areas at the site of all new permanent works, excavated, filled and graded areas, and spoil areas, together with a 10-foot strip measured horizontally beyond and contiguous thereto for the foundation areas for dam, dike, and access road to dam embankment, a 10-foot strip for dam, dike, spillway, and access road, measured horizontally beyond and contiguous thereto for all cut sections for dam, dike and access road, and as required for the log boom, and as otherwise required and to the limits as shown on the drawings. Where grubbing is not specified, stumps shall be left not more than 6 inches higher than the existing ground, except as specified in Section 3 relative to clearing in spoil areas. In areas of road relocations and in pavements, do not clear beyond top of cuts or toe of fills.

c. Grubbing. - The areas to be grubbed include the foundation areas for the dam and dike embankments, the foundation areas for the highway embankments as hereinafter specified, and the areas for all cuts. The areas of fill for the highway work shall be grubbed when the areas of fill measured from subgrade is 3 feet or less. Also included in areas to be grubbed are the areas of a strip 10 feet wide to be measured horizontally and contiguous to the described areas of the dam, dike and access road, to be grubbed, and areas of a strip 10 feet wide to be measured horizontally and contiguous to the limits of all cut sections of the dam, dike, spillway, and access road. In grubbing out stumps, all tap and lateral roots or other growth over 1-1/2 inches in diameter shall be removed to a depth of 1-1/2 feet below the stripping line in areas to be stripped and to a depth of 1 foot below the ground surface in grubbing areas not to be stripped. In stripping areas within previously wooded areas, as determined by the Contracting Officer, roots with a diameter greater than 1/2-inch shall be removed for a depth of 8 inches by the use of an approved root raker or scarifier after the stripping operations are completed. The rooting or scarifying operations shall be repeated as often as considered necessary by the Contracting Officer to insure satisfactory removal of roots. After each operation, exposed roots on the surface shall be removed prior to the succeeding operation.

d. Disposal. - All materials removed during the clearing and grubbing operations shall be disposed of by burning or removal to approved disposal areas outside of the reservoir area, unless otherwise authorized, except that merchantable timber shall become the property of the contractor and shall be removed from the site of the work. No material shall be thrown into or left along the banks of the river. The disposal of material shall closely follow the removal thereof so that in case of high water a minimum of debris and brush will be washed downstream. At no time shall such material be placed on land outside the work areas. The contractor shall be responsible for compliance with all Federal and State Laws and regulations relative to the building of fires. Disposal by burning shall be under constant attendance until fires have burned out or have been extinguished. Whenever elm trees are cut, all portions of the trees which are neither buried as directed or burned shall be thoroughly sprayed with a two percent emulsion of DDT.

1-04. LOWERING WATER SERVICE. - The service line to be lowered is indicated on the plans. The contractor's obligations shall consist of excavating and exposing the existing service line. Excavation in the vicinity of the pipe, including the undercut area provided for lowering the line to the depth specified, shall be done by hand shovel. The actual lowering of the service line shall be accomplished by the town of Monson Water Department which will supply all the pipe fittings and any additional material necessary to lower the line. The backfilling and compaction of

the trench shall be done by the contractor as specified in Section 11, EXCAVATION, TRENCHING AND BACKFILLING FOR PIPE CULVERTS AND DRAINS, for the excavation and backfilling for culverts and drains other than the three large culverts.

1-05. PLUGGING THE EXISTING WATER MAIN. - The plugging of the existing water main near Wales Road which will remain in operation along with excavation, compaction, and backfilling therefor shall be done by and at the expense of the Town of Monson Water Deaprtment. The contractor shall coordinate all work on the existing mains with the town's water department.

1-06. REMOVAL OF DEBRIS FROM EXISTING CULVERTS. - The existing 48" x 46" C.M.P. culvert leading to the new 54" culvert and the existing culvert in the vicinity of the East Hill Road turn-around shall be cleaned of all debris. The entrance and discharge areas shall be cleaned up and shaped to provide an efficient flow condition. See Paragraph 12-06.

1-07. PAYMENT. - a. Except as noted below, payment for all work in connection with the preparation of the various sites of the work as specified above will be made at the contract lump sum price for Item 1, "Preparation of Site". The lump sum price for this item shall reflect the salvage value of the merchantable timber and structures to be removed.

b. Payment for filling holes due to removal of stumps and for filling and backfilling due to removal of existing structures occurring within limits of embankment foundation areas will be paid for at the applicable contract unit priced for the materials used. Payment for the excavation required due to removal of the existing cast iron water line occurring within the limits of embankment foundation area of dam will be paid for at the contract unit price for Item 3, "Unclassified Excavation - General."

SECTION 2

CONTROL AND DIVERSION OF WATER
(Item 2)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
2-01	Scope	2-1
2-02	Dam	2-1
	a. Diversion	2-1
	b. Existing Monson Reservoir	2-1
	c. Cofferdams	2-1
2-03	Three Large Culverts	2-2
2-04	Payment	2-2

SECTION 2

CONTROL AND DIVERSION OF WATER
(Item 2)

2-01. SCOPE. - a. The work covered by this section of the specifications consists in furnishing all plant, labor and appliances, and in performing all operations in connection with diverting and controlling the Conant Brook in connection with the construction of the dam and the 54-inch, 15-foot and 17-foot culverts, dewatering the construction areas within the limits of applicable permanent works and structures, so that these structures may be constructed in the dry, all in accordance with this section of the specifications. The work under this section shall also include all pumping, dewatering and drainage for lowering the ground water table so that the work as specified above and in other sections can be constructed in the dry.

b. All other requirements relative to control and diversion of water are specified and included under the applicable excavation sections of the Technical Provisions.

2-02. DAM. - a. Diversion. - (1) The contractor shall initiate and complete the outlet works including the conduit prior to any diversion. Paragraph SC-61 covers restrictions as to when the outlet works and other items of work can be performed, and these restrictions are in addition to those hereinafter stated.

(2) When the relocation of Wales Road is substantially completed and when traffic over existing Wales Road has been discontinued and when the existing utility lines on Wales Road have been removed by others, and when the new water supply system has been completed, and when so notified in writing by the Contracting Officer, the contractor shall complete the outlet works and divert the brook through the outlet works by constructing upstream and downstream cofferdams.

b. Existing Monson Reservoir. - The contractor shall make his own arrangements with local authorities relative to lowering of the existing reservoir during his construction of the dam and appurtenances. All cofferdams built within the existing reservoir shall be removed when no longer required to return reservoir to its original capacity.

c. Cofferdams. - The contractor may select any plan for diversion which will permit excavation for the dam embankment, trenches in dam embankment, foundation, grouting, and construction of the structures including the embankment in the dry. In order to place the dam embankment materials in the dry, temporary upstream and downstream cofferdams shall be required. These cofferdams shall be located outside the limits of the permanent structure. The contractor shall select the location, type of construction and height of these cofferdams. Any damage to new and permanent work resulting from flooding due to overtopping or other failure of cofferdams' shall be repaired by the contractor

and at no additional cost to the Government. If considered satisfactory by the contractor, excess materials from required excavations and materials designated as spoil may be used in construction of cofferdams. All materials placed in the cofferdams shall be removed prior to completion of the work and placed in spoil areas.

2-03. THREE LARGE CULVERTS. - All streams which may interfere with the proper construction of the 54-inch, 15-foot and 17-foot culverts and appurtenant items shall be controlled and/or diverted as required in order to perform the work specified in other sections. No excavation or diversion will be permitted close enough to a culvert excavation to interfere with the specified width of pipe bedding and culvert backfill.

2-04. PAYMENT. - a. The contract lump sum price for Item 2, "Control and Diversion of Water" shall include payment for control, diversion and care of the brook during construction; the construction, maintenance and removal of cofferdams, including the rebuilding of cofferdams in case of destruction by flood.

b. The contract price under Subparagraph 2-03a. above shall also include the costs for all pumping, drainage and dewatering necessary to obtain and maintain in a dry condition all excavation and work areas, and, in connection with the dam and culverts shall also include the maintenance of unobstructed flow prior to diversion, and through diversion channels during the remaining period of the contract. The lump sum price for Item No. 2 shall also include all costs in connection with the requirements for lowering the water table and dewatering during the construction of the dam foundation cut-off and drainage trenches and other trenches.

c. Estimates for partial payments for this work for the dam will be as follows: Ten percent of the contract price when all work in connection with control and diversion of water for the three large culverts is completed; forty percent of the contract price when the brook has been diverted and all cofferdams for the dam construction have been constructed as specified; forty percent of the contract price when the entire working area for the dam has been unwatered and the embankment completed to elevation 760.0; and ten percent of the contract price and when all cofferdams have been disposed of as specified.

SECTION 3

EXCAVATION
(Items 3, 4, 5 and 7)

(Index)

Paragraph No.	Paragraph Title	Page No.
3-01	Scope	3-1
3-02	General Provisions	3-1
	a. Utilization of Materials	3-1
	b. Disposal of Excess and Unsuitable Materials	3-2
	c. Stockpiling	3-2
	d. Shoring and Sheeting	3-2
	e. Temporary Drains, Pumping and Unwatering	3-3
	f. Stones in Excavations	3-3
	g. Salvage of Stripping Material for Topsoil	3-3
3-03	Classification	3-3
	a. Unclassified Excavation	3-3
	b. Rock Excavation	3-3
	c. Stripping	3-4
3-04	Unclassified Excavation, General	3-4
	a. General	3-4
	b. Stripping	3-4
	c. Grading	3-5
	d. Trenches in Dam Embankment Foundation	3-5
3-05	Cleaning of Bedrock Surfaces	3-5
	a. General	3-5
	b. Machine Cleaned	3-6
	c. Hand Cleaned	3-6
3-06	Unclassified Excavation, Borrow	3-6
	a. General	3-6
	b. Clearing and Stripping	3-6
	c. Drainage	3-7
	d. Grading	3-7
	e. Placing Stripping Materials	3-7
	f. Sequence of Operations	3-8

Paragraph No.	Paragraph Title	Page No.
3-07	Rock Excavation	3-8
	a. General	3-8
	b. Blasting Procedures	3-8
	c. Final Grades and Excavation Lines	3-9
	d. Blasting	3-10
	e. Definition of Lines	3-10
	f. Slides	3-11
	g. Rock Foundation Preparation	3-11
	h. Clean-Up for Inspection	3-11
3-08	Measurement	3-11
	a. Unclassified Excavation, General	3-11
	b. Unclassified Excavation, Borrow	3-12
	c. Rock Excavation	3-12
	d. Machine Cleaned Bedrock Surfaces	3-12
	e. Hand Cleaned Bedrock Surfaces	3-12
3-09	Payment	3-13
	a. Unclassified Excavation, General	3-13
	b. Unclassified Excavation, Borrow	3-13
	c. Rock Excavation	3-13
	d. Hand Cleaned Rock Surfaces	3-14

SECTION 3

EXCAVATION
(Items 3, 4, 5 and 7)

3-01. SCOPE. - a. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, and appliances, and of performing all operations in connection with all excavations (including excavation for the removal of the existing 12-inch cast iron water main in the foundation area of the dam embankment) and cleaning of bedrock surfaces, except as noted below, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract. This section of the specifications does not cover excavations for (1) bubble gage shelter (2) the removal of temporary cofferdams (3) drains and culverts except for the 54", 15' and 17' culverts, and (4) miscellaneous excavations which are covered under other sections of the specifications.

b. The term "required excavation" as used in this section is defined as any or all excavations covered in this section other than those in the borrow area.

3-02. GENERAL PROVISIONS. - a. Utilization of Materials. - All excavated materials shall be satisfactorily disposed of as directed. With the exception of unsuitable materials, stripping materials not utilized for production of topsoil, and materials designated herein as spoil, all other excavated material shall be used to the extent possible in the permanent works. Earth material from the required excavations for the construction of the foundation drain between approximately Sta. 5+00 and Sta. 6+00, for the foundation cut-off between approximately Sta. 5+50 and Sta. 8+00, for the removal of the existing 12 inch cast iron water main in the foundation area of the dam embankment, and for the spillway channel between approximately Sta. 14+00 and Sta. 15+00 are designated as spoil. Only materials unsuitable for use in the construction of embankments, including highway embankments, excess materials, and materials designated as spoil may be used in the construction of cofferdams. The Contracting Officer shall be the sole judge as to the suitability of all materials. Materials shall not be spoiled unless specifically authorized or stated herein. Materials from required excavations and the borrow area shall be utilized in the permanent work as specified in other sections of these specifications. The contractor shall conduct the work in a manner to utilize all suitable materials from the required excavations in the permanent work with the exceptions described above. To insure the greatest possible use of materials from required excavations without stockpiling, all required excavations for the project (except stripping and those excavations listed above from which the earth materials are designated as spoil) shall be deferred until such time as the materials from these excavations can be used for the construction of embankments and other fills unless the contractor elects to stockpile these materials at his own expense.

b. Disposal of Excess and Unsuitable Materials. - Excess and unsuitable material from required and borrow excavations shall be spoiled only when specifically authorized. All materials which are authorized to be spoiled shall be disposed of in the spoil areas shown on the drawings and in excavated portions of the borrow areas designated by the Contracting Officer as spoil areas. Prior to placement of materials, the foundation areas of all spoil areas shall be cleared of all standing timber leaving no stumps higher than 3 feet above the adjacent ground surface and the material thus obtained shall be disposed of as specified in Section 1, PREPARATION OF SITE for materials obtained from other clearing operations. Spoil materials shall be placed to the lines and grades shown on the drawings or as directed. All spoil areas shall be graded to the final limits shown on the drawings or as directed so as to provide sightly and smooth surfaces sloped for suitable drainage. All spoil areas unless otherwise shown on the drawings shall be seeded and mulched as specified in Section 17, TOPSOILING, SEEDING, AND MULCHING.

c. Stockpiling. - The contractor shall stockpile stripping materials required for the production of topsoil and materials from required rock excavations for processing for rock slope protection materials as required for the execution of the work. In addition, the contractor may stockpile other materials for his own convenience subject to prior approval. All materials to be stockpiled shall be placed in approved stockpile areas which have been cleared, grubbed and graded. Stockpiles of impervious fill and random fill materials shall be located in approved well drained areas and the surfaces of the stockpiles at all times shall be graded for drainage and rolled so as to be smooth and relatively watertight. Stockpiles of materials from required rock excavations shall be maintained free of earth and shall be constructed in layers in such a manner as to prevent segregation. No rock slope protection material shall be stockpiled after grizzlying. No separate payment will be made for the placement of materials in stockpiles or their excavation therefrom, for the grading of stockpile areas before placement and after removal of the materials. Payment for all work in connection with stockpiling materials under this contract shall be included in the contract unit price per cubic yard for the excavation of the materials from their original sources. Stockpiled materials in excess of the quantity used in the permanent work shall be removed and placed in designated spoil areas unless the stockpile area is approved as a spoil area.

d. Shoring and Sheeting. - The contractor shall be responsible for the unfinished work, and for the safety of workmen from danger of caving and slides unless otherwise specified. Shoring and sheeting may be used at the option of the contractor, except that if considered necessary and the contractor does not use them, their use will be ordered at no additional cost to the Government. Shoring and sheeting shall not be used for excavations which are to be filled or backfilled with compacted materials unless specifically authorized. Shoring and sheeting shall be erected in a safe and workmanlike manner, in accordance with the requirements of the Corps of Engineers Manual, "General Safety Requirements",

and shall be placed in such a way as to afford an ample clearance for ready inspection of permanent work. Shoring and sheeting shall be removed upon completion of the permanent work as soon as the construction does not require its use. Where shoring and sheeting are used in lieu of excavations to full dimensions of the pay lines, measurement will be taken to the payment lines as shown on the drawings.

e. Temporary Drains, Pumping and Unwatering. - The contractor shall maintain the sites of work and adjacent grounds in a well-drained condition. Temporary drains, cofferdams, and ditches required shall be constructed by the contractor at no additional expense to the Government. The contractor shall provide all necessary equipment and material, and shall unwater and maintain in a dry condition the foundation areas for the various features of work to the extent required by the provisions in this and other sections of the specifications for excavation, preparation of foundation, grouting, placement of fill and backfill and for the construction of drains, culverts, and concrete structures for the dam, dike, and roads. All cofferdams shall be removed to the satisfaction of the Contracting Officer. Payment for pumping, unwatering, and lowering the ground water table for various features shall be included in applicable payments for excavations of materials, except as provided in Section 2, CONTROL AND DIVERSION OF WATER of these specifications.

f. Stones in Excavations. - Boulders and stones will be encountered during unclassified excavation. Boulders and stone encountered in required excavations shall be disposed of as directed. Stones and boulders shall be removed from random and impervious fill materials prior to compaction and shall be utilized in rock slope protection layers as specified in Section 5, EMBANKMENTS, DAM AND DIKE and Section 6 ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL, of these specifications. Stones and boulders removed from material during borrow excavation shall be disposed of within the excavated portions of the borrow area in an approved manner to form sightly piles.

g. Salvage of Stripping Material for Topsoil. - To the extent required, portions of stripping material shall be processed for topsoil in accordance with Section 17, TOPSOILING, SEEDING, AND MULCHING, of these specifications.

3-03. CLASSIFICATION. - Except as otherwise prescribed, excavations will be classified as follows:

a. Unclassified Excavation. - Unclassified excavation shall comprise the satisfactory removal of all materials including those removed with the aid of drilling and blasting, except the materials removed as rock excavation and defined in Subparagraph b below.

b. Rock Excavation. - Rock excavation shall consist of the satisfactory removal of the following:

(1) Boulders or rock blocks detached from bedrock measuring 2 cubic yards or more in volume.

(2) Bedrock which, as determined by the Contracting Officer, can be removed only by systematic and continuous drilling and blasting. Where material is encountered for which the contractor claims classification as rock excavation for its removal, the material shall be uncovered and exposed and the Contracting Officer notified before proceeding with its excavation. The contractor shall not proceed with the excavation of such material until it has been cross-sectioned and classified by the Contracting Officer. Failure on the part of the contractor to uncover and expose such material, to notify the Contracting Officer, and allow time for cross-sectioning the undisturbed surface of such material will forfeit the contractor's right of claim to any classification other than that allowed by the Contracting Officer for the areas of work in which such materials occur.

c. Stripping. - Stripping shall consist of the removal of surficial materials judged by the Contracting Officer to be unsatisfactory for use as foundation materials or for the use in the construction of fills which materials shall include sod, topsoil, stones, buried drains, existing foundations, swamp deposits, organic materials, artifical fills, road pavements, base courses for pavements, all loose rock and boulders on the surface, and other materials judged by the Contracting Officer as objectionable. Stripping shall be unclassified excavation except for the removal of boulders or detached rock blocks measuring 2 cubic yards or more in volume which will be rock excavation.

3-04. UNCLASSIFIED EXCAVATION, GENERAL. - a. General. - Unclassified excavation, general, shall consist of the satisfactory removal, hauling to project features, hauling to and placement in spoil areas and hauling to, placement in and rehandling from stockpiles of material removed by unclassified excavation from within the lines, grades, and slopes of all project work as shown on the drawings or as modified in the field by the Contracting Officer, except materials excavated from the borrow areas or as otherwise specified in Section 1, PREPARATION OF SITE. All excess and unsuitable materials removed by unclassified excavation, general, shall be disposed of in the spoil areas as specified in Paragraph 3-02. The sequence of operations, to insure the maximum utilization of materials from required excavations, shall be as specified in Paragraph 3-02 above.

b. Stripping. - Stripping shall be performed within the areas shown on the drawings and shall be limited in depth so as to remove only those surficial materials considered to be unsatisfactory for embankment fill material or unsuitable as a foundation material. Stripping operations shall be performed in such a manner as to salvage materials acceptable for processing for topsoil to the extent required as specified in Section 17, TOPSOILING, SEEDING AND MULCHING. Only natural surface soil containing humus material shall be stockpiled. The Contracting Officer shall guide and control the extent and final depth of stripping and may direct the contractor to strip to limits and depths different from those shown on the drawings at no change in the contract unit prices.

c. Grading. - Roads, highways, turnarounds, parking areas and other required areas shall be graded in accordance with the sections indicated on the drawings. Shoulders, ditches, side slopes, subgrades, and other designated areas shall be trimmed and dressed in a neat and workmanlike manner to the lines and grades shown on the drawings or staked in the field.

d. Trenches in Dam Embankment Foundation. - (1) Trenches excavated in the dam embankment foundation area for the construction of the foundation drain and foundation cut-off shall be excavated to the bottom widths, depths, and limits shown on the drawings except as otherwise specified herein. In reaches of trench where excavation to bedrock is indicated on the drawings and where bedrock is encountered at a grade below that indicated, the contractor shall widen the excavation to the full bottom width shown on the drawings by adjusting the downstream limits of the trench. Excavation of the trench for the foundation cut-off shall be performed in a manner that will permit the placement and compaction of impervious fill material in reaches of at least 200 feet in length.

(2) The trench excavated in the foundation area of the dam embankment for the removal of the existing 12-inch cast iron water main shall be excavated to the depth of the invert of the pipe and to the bottom width and limits indicated on the drawings. Prior to excavation of the full length of the trench the contractor shall confirm the location of the pipe as shown on the drawings by means of test pits unless the pipe has been previously encountered in the excavations for the foundation cut-off and drainage trenches. Excavation of the trench shall be performed in a manner that will permit the placement of compacted fill material in reaches of at least 200 feet in length.

(3) The contractor shall be responsible for providing adequate means and provisions for completely dewatering the trench excavations for the entire reaches in which foundation preparation, grouting, and placement of compacted fill or backfill is being accomplished. The contractor shall also be responsible for producing and maintaining stable side slopes excavated to the lines shown on the drawings or specified herein.

3-05. CLEANING OF BEDROCK SURFACES. - a. General. - The preparation of rock surfaces against which concrete is to be placed is specified in Section 9, CONCRETE. Bedrock surfaces in excavations for the dam conduit against which gravel fill or backfill is to be placed shall be cleaned of all dirt and loose displaced rock immediately prior to the placement of the gravel fill or backfill. The excavation at, and cleaning of, other designated bedrock surfaces shall be in accordance with the provisions in the following subparagraphs. Areas other than those designated on the drawings shall be cleaned as directed. All excavation required for the cleaning and preparation of the surfaces shall be paid for at the applicable contract unit prices for Item 3, "Unclassified Excavation - General", and Item 5, "Rock Excavation". In addition, payment for cleaning shall be made as stated elsewhere in this section.

b. Machine Cleaned. - Areas of natural rock surfaces within limits of the foundation of the dam embankment as designated on the drawings shall be machine cleaned. Machine cleaning shall consist of the removal of all earth and loose rock and rock fragments from the entire bedrock surface including areas of depression, large crevices, and large open joints. The material need not be removed in areas where the horizontal width of the openings are less than 16 inches. The degree of cleaning shall at least be equivalent to that obtainable with a toothless one-quarter yard backhoe dipper after the material has been loosened by prior operations. No rock excavation will be required to remove overhangs.

c. Hand Cleaned. - All areas of rock surfaces thus indicated on the drawings shall be "hand cleaned". Those portions of the areas where the concrete of the structures will be in contact with the rock shall not be "hand cleaned", but shall be prepared in accordance with provisions of Section 9, CONCRETE. Hand cleaning of natural bedrock surfaces and rock surfaces produced by rock excavations shall consist of the removal of all earth, disintegrated bedrock, semi-detached or detached rock blocks and rock fragments from the entire bedrock surfaces including areas of depressions, crevices and joints. The bedrock surface shall be cleaned by washing or sweeping. In addition, all cracks, joints and crevices in the bedrock surfaces shall be thoroughly cleaned by use of jets of air or water or a combination thereof to the satisfaction of the Contracting Officer immediately prior to the filling of these openings with mortar in areas to be covered with impervious or random fill or impervious backfill as specified in Section 5, EMBANKMENTS - DAM AND DIKE. Hand-cleaning shall be accomplished after the special rock excavation at the surface as specified in Paragraph 3-07 has been done.

3-06. UNCLASSIFIED EXCAVATION, BORROW. - a. General. - Unclassified excavation, borrow, shall consist of the satisfactory removal, hauling to the project features, hauling to and placement in stockpiles and spoil areas of materials excavated from the borrow area and removed by unclassified excavation as defined in Paragraph 3-03 of these specifications. Materials shall be excavated from the designated borrow area to the extent required to obtain suitable impervious and random fill materials. The Contracting Officer shall guide and control the stripping, removal of unsatisfactory surface materials, depths of excavation and the selection of material in the borrow areas to obtain material meeting the specified requirements. Boulders and oversize stones removed during excavation shall be disposed of as specified in Subparagraph 3-02f. Unless specifically authorized by the Contracting Officer or shown on the drawings, excavations shall not extend below Elev. 771 or the bedrock surface, whichever is higher.

b. Clearing and Stripping. - Part 1 and Part 2 of the borrow area shall be cleared to within 25 feet beyond the limits of excavation except as otherwise directed. Part 3 of the borrow area shall be cleared when and if the Contracting Officer determines that the use of Part 3 is necessary. All clearing operations shall be as specified in Section 1, PREPARATION OF SITE for clearing operation at other locations.

The borrow areas shall be stripped only within the area of the limits of actual excavation. Stripping shall be extended only to the depth required to remove sod, forest debris, humus material containing numerous small roots, all as directed. The depth of stripping shall not be extended in order to remove occasional or large roots which can be removed during placement of the fill materials. All stripping material containing humus and organic material shall be salvaged and stockpiled for use in the borrow areas as specified in subparagraph e below.

c. Drainage. - Prior to the start of borrow excavations, the contractor shall construct ditches and embankments along the limits of excavations to prevent surface water from entering into the area of excavation. Additional drainage facilities shall be constructed in the excavation areas to channel subsurface and rain water from areas of excavation operations. All operations in connection with drainage, including the filling of temporary ditches, shall be subject to the approval of the Contracting Officer, and, if not considered adequate by the Contracting Officer, additional facilities shall be provided. Permanent interceptor ditches shall be constructed along the top of slopes and elsewhere at locations directed by the Contracting Officer. The depths, excavation slopes and exact locations of the permanent ditches shall be as directed in the field. Materials from these ditches shall be spoiled between the ditch and the excavation areas unless otherwise directed.

d. Grading. - The contractor shall grade all excavated portions of the borrow area so as to maintain these portions free of water during and after excavation. Where bedrock is not exposed during borrow excavations, the excavations will be performed in such a manner as to leave earth side slopes no steeper than 1 vertical to 3 horizontal. Upon completion of excavation operations in the borrow area, its surface shall be graded so as to leave reasonably uniform 1 on 3 earth slopes and a neat bottom surface. The finished bottom of the excavation shall be uniformly graded to the satisfaction of the Contracting Officer and shall be approximately horizontal with grades to provide drainage no steeper than 10 percent. Bedrock surfaces exposed during borrow excavations shall be cleaned to the extent feasible with bulldozers. The final earth excavation slopes shall be trimed or graded with a bulldozer or similar equipment to provide finished slopes composed entirely of undisturbed natural soil. Filling on the slopes shall be limited to that required to fill erosion areas immediately prior to the spreading of stripping material thereon.

e. Placing Stripping Materials. - Stripping material containing humus and organic material, stockpiled as specified in Subparagraph b above, shall be spread to a loose thickness of at least 8 inches on excavation slopes and in the bottom of the borrow area, except that spreading of stripping material on extensive areas of bedrock surfaces will not be required. All of the stockpiled stripping material from the borrow area shall be spread on either the excavated slopes or on the

bottom surface of the borrow area. All material which will interfere with placement, spreading and seeding operations shall be removed from the stripping material and disposed of as required for clearing. Fine grading of spread stripping material will not be required; however, immediately prior to seeding, the spread stripping material shall be regraded to form a smooth even surface, free of gullies and eroded areas. The spread stripping material shall be compacted by two coverages of the tread of a crawler type tractor. Stripping material, spread and otherwise treated as specified above, shall be fertilized, seeded and mulched as specified in Section 17, TOPSOILING, SEEDING AND MULCHING.

f. Sequence of Operations. - Approximate depth ranges of impervious and random fill materials in the borrow area are shown on the drawings. All operations shall be scheduled so that the construction of the embankments and highway fills may proceed in accordance with the provisions of Section 5, EMBANKMENTS - DAM AND DIKE and Section 5A, HIGHWAY FILL. The sequence of stripping and excavation operations in the borrow area shall be such that stockpiles and spoil piles can be placed within the excavated portions of the borrow area. Initial borrow excavations will be restricted to that portion of the borrow area designated on the drawings as Part 1. Excavation will be extended into Part 2 only when, in the opinion of the Contracting Officer, all random fill material from Part 1 has been removed and replaced in the highway fills or in the random fill zone of the dam embankment. Excavation will be extended into Part 3 only when, in the opinion of the Contracting Officer, its use is required to obtain the required quantities of materials.

3-07. ROCK EXCAVATION. - a. General. - The contractor shall perform rock excavation required for the permanent work, to the lines and grades shown on the drawings or as otherwise directed. The contractor shall mark the edge of rock cut with paint or other suitable means to an accuracy of 1-inch ± from the theoretical line of drilling prior to drilling operations. Excavation to lines and grades other than those shown on the drawings will be directed in writing. In areas of rock excavation where the rock is to be grizzlyed and used in the permanent work, the rock surface including the required width of berms shall be cleaned by bulldozer or other standard excavating equipment prior to rock excavation. All berms on the rock surface shall be maintained and the surface kept clean throughout construction to completion of the project. Precautions shall be taken to insure the safety of personnel from hazards of rock falls or rock slides.

b. Blasting Procedures. - The contractor shall submit for approval a separate plan of operations for the removal of rock in the spillway, conduit, and intake and outlet channels. The submittals shall be made in triplicate and shall describe the proposed methods with variations in procedures together with sketches indicating bench depths,

number, location, diameter, depth, and inclination of holes, amount, type and strength of explosives per hole and per blast, sequence and delays in firing, stemming, and any other data which the Contracting Officer may deem pertinent to his consideration for approval. Approval of the plans will not relieve the contractor of his responsibility in connection with damage resulting from blasting operations. As part of his approval for each plan, the Contracting Officer will designate an area of exploratory rock excavation to which the contractor shall confine his first drilling and blasting operation. After the first blasting operation, all fragments shall be removed and the faces cleaned for examination by the Contracting Officer. No additional drilling or blasting shall be performed until the examination has been completed and the original plan of operations re-affirmed or revised in writing. Additional changes in approved plans will be made when required as outlined below.

c. Final Grades and Excavation Lines. - From observations of the breaking characteristics of the rock as the excavation progresses, the charges used in blasting and the loading and spacing of holes may be revised, as necessary, to prevent overbreak and shattering of rock outside the design lines or grades. The intent is to limit the blasting so as to break the rock to the lines and grades shown on the drawings and yet not fracture the rock, open incipient fractures, enlarge existing fractures, make the excavation unduly large or irregular, or cause other damage outside the prescribed limits of excavation. When, in the opinion of the Contracting Officer, damage is being done to the rock at the prescribed limits of excavation, the contractor will be required to revise his drilling and blasting procedure to obtain sound slopes and grade lines and such revisions, if necessary, shall include the drilling of holes as closely spaced as 24 inches at no additional cost to the Government. In excavations over 15 feet and up to 45 feet in depth, no hole for blasting shall be drilled more than two-thirds the depth of proposed excavation. In excavations over 45 feet in depth no hole for blasting shall be drilled more than 30 feet without written approval. As excavations approach final lines and grades, the depth of holes for blasting and the amount of explosives shall be reduced progressively. Whenever, in the opinion of the Contracting Officer, blasting to grade or lines may damage the rock against which concrete is to be placed, excavation within 1 foot of design lines and grades shall be done by drilling, chipping, barring, wedging, or similar methods in which explosives are not used and which will leave the foundation or side walls in a solid and unshattered condition. Whenever a bench or other horizontal excavated rock surface intersects a vertical or sloped face, the excavation of the horizontal surface shall be completed before the vertical or sloped surfaces is begun. Blasting for the bench excavation shall be carefully controlled to prevent damage to that rock which will subsequently form the vertical or sloped face. Where major incipient or open planes of cleavage or jointing are encountered which approximate and are outside the design lines and grades and present a potential slip or slide condition not amenable to bolting, excavation shall be made to planes as directed by the Contracting Officer at applicable unit prices. The side of all rock

cuts will be carefully scaled of all loose and projecting rock as excavation progresses. The contract price for rock excavation shall include scaling of the side slopes. Rescaling will be required at no additional cost to the Government as often as may be necessary to permit thorough inspection of the rock surface or whenever rock remaining in the side slopes loosens to the extent that it becomes a potential safety hazard in the opinion of the Contracting Officer.

d. Blasting. - Blasting shall be governed by the safety requirements of Paragraph SC-43 of the SPECIAL CONDITIONS, and the following requirements. All damage resulting from blasting beyond the limits of the work shall be repaired or otherwise satisfactorily cared for by the contractor at his expense. Blasting within 100 feet of concrete which has been in place less than seven (7) days will not be permitted under any circumstances, and blasting in the vicinity of concrete older than seven (7) days will be permitted only if approved in advance by the Contracting Officer. The contractor or his surety shall make prior inspection or investigations of structures near the areas of blasting and shall provide such vibration monitoring as necessary during the blasting operations to assure conformance with regulatory statutes or directives established by the state or other authorities to limit vibratory effects. Such investigations shall be conducted and reported by a qualified vibration engineer, and copies in duplicate of any reports will be furnished the Contracting Officer. Reports shall include plan of drilling, amount and type of loadings, kind and distribution of blasting caps, delays used and amount of explosive per delay, order of firing, names of observers and interpreter, distance and direction of recording station from blast area, type of ground at recording station, exact time of reading, displacement and frequency, copy of records and brief comment on vibratory effects. Costs of vibration monitoring or other investigations in connection with vibration engineering shall be met by the contractor.

e. Definition of Lines. - (1) Rock excavation on which concrete structures are to be placed shall be to the following lines:

(a) The "A" line indicates the minimum thickness of concrete and is the minimum excavation line. No excavation will be required beyond this line.

(b) The "B" line is located 12 inches outside the "A" line on the side slopes and 6 inches outside the "A" line on horizontal surfaces. Payment for concrete and rock excavations will be made to the "B" line regardless of whether the actual limits fall inside or outside the "B" line. In the event that excavations for any structures should reveal that rock or other material encountered at design grades would provide unsatisfactory foundation, the excavation limits in the area shall be adjusted as necessary to provide an acceptable foundation. Necessary adjustments in foundation grade will be made by the Contracting Officer and will be furnished to the contractor in writing. Additional excavations and concrete quantities required by such adjustment will be paid for at the existing contract prices for these items.

f. Slides. - In the event of rock slides in any area of rock excavation which are determined by the Contracting Officer to be caused through no fault or negligence on the part of the contractor, the contractor will be directed in writing as soon as practicable after the slide occurs to perform such corrective measures as are deemed necessary by the Contracting Officer and will be paid for at the contract unit price per cubic yard for Rock Excavation. Any slides not covered by a written directive by the Contracting Officer shall be removed and disposed of at no additional cost to the Government.

g. Rock Foundation Preparation. - (1) Concrete Structures. - Rock surfaces upon or against which concrete is to be placed shall be prepared in accordance with Section 9, CONCRETE.

(2) Embankment Fill and Backfill. - To the extent practicable and at the direction of the Contracting Officer, overhangs and abrupt, prominent protrusions of the rock surface in areas to be hand cleaned under the compacted impervious fill and random fill sections of the dam embankment shall be carefully removed by barring, wedging, drilling and light blasting to the surrounding general level of the rock surface. Surfaces upon or against which other earth embankment fills or earth backfill is to be placed shall be cleaned as specified in Paragraph 3-05 for other rock surfaces.

h. Clean-Up for Inspection. - A clean-up condition shall be maintained at all times during grouting operations to facilitate observations for leaks and their caulking. Clean-up shall consist of removal of all loose materials and water, followed by thorough cleaning of rock surfaces by jets of air, jets of water, or a combination of both as directed. Where questionable foundation conditions exist during excavation, a preliminary clean-up may be required for purposes of inspection over an area specified by the Contracting Officer. If, after clean-up, the foundation is found to be unsatisfactory, additional excavations shall be made as directed, and this procedure of excavation and clean-up for inspection will be repeated until a satisfactory foundation is reached and at no increase in the contract unit price for such work.

3-08. MEASUREMENT. - a. Unclassified Excavation, General. - Measurement for unclassified excavation, general, as classified in Paragraph 3-03 and as defined in Paragraph 3-04, herein, to be paid for, will be by the cubic yard for the amount of material removed as unclassified excavation, general, and disposed of in accordance with these specifications. Areas from which materials are to be removed as unclassified excavation, general, will be surveyed immediately prior to commencement of the excavation. The survey will be made after clearing but prior to grubbing. All measurements will be based on this survey regardless of any changes which may occur in the areas during prosecution of the work. Measurements will be made between the grade and slope lines indicated on the drawings or staked in the field and the ground surface as indicated by the survey. Wherever the excavation or stripping extends to a bedrock surface or to grades not definitely defined by lines shown on the drawings or staked in the field, a survey will be made of the rock surface or final grade to determine the lower limits of measurement for unclassified excavation, general. The volume to be paid for shall

not include the volume of materials excavated below or outside the measured limits defined above except that which is specifically authorized to remove unsuitable foundation material. The volume of excavation to be paid for as unclassified excavation, general, shall not include the volumes of materials paid for or included under other items of work.

b. Unclassified Excavation, Borrow. - Measurement for unclassified excavation, borrow, as defined in Paragraph 3-06 of these specifications, to be paid for, will be made by the cubic yard for the amount of materials satisfactorily removed as unclassified excavation, borrow, and disposed of in accordance with the specifications and drawings. A survey of the borrow areas will be made after clearing and just prior to the beginning of stripping operations in the borrow area and all measurements for the excavation will be based on this survey without regard to any changes in the ground surface of the borrow area that may occur during the prosecution of the work. Surveys of the borrow area will be made after completion of excavation and grading but prior to the placement of stripping material on the surfaces exposed by the excavation. Where the final borrow area contains spoil material, the final survey in the spoil area will be the base surface of such material. Measurement for permanent interceptor ditches outside the limits of the excavation for borrow, shall be the volume between the ground and final surfaces as indicated by the above mentioned surveys. The volume of borrow to be paid for shall be the volume as measured above reduced by the volume of boulders excavated from the borrow area and classified and paid for as Item 5, "Rock Excavation".

c. Rock Excavation. - Measurement for rock excavation as classified in Paragraph 3-03b herein, will be by the cubic yard of material satisfactorily removed by rock excavation and disposed of in accordance with the specifications and drawings. Quantities of bedrock excavation as rock excavation, including the removal of overhanging rock during foundation preparation will be measured in place as the volume between the grades and lines indicated on the drawings, or as modified by the Contracting Officer, and the surface of the rock as indicated by the surveys specified in Paragraph 3-03 herein. The volume of rock to be paid for shall include the sum of the volumes of boulders and rock blocks classified as rock excavation. Only those blocks and boulders will be paid for which have been measured by the Contracting Officer. See Paragraph 3-07e for definition of payment lines for rock excavation in locations where concrete is to be placed against rock surfaces.

d. Machine Cleaned Bedrock Surfaces. - No separate measurement will be made for machine cleaned bedrock surfaces as defined in Paragraph 3-05 of these specifications. All costs in connection with machine cleaned bedrock surfaces shall be included as applicable under Item 3, "Unclassified Excavation - General" and Item 5, "Rock Excavation".

e. Hand Cleaned Bedrock Surfaces. - Measurement for hand cleaned bedrock surfaces as defined in Paragraph 3-05 of these specifications to be paid for will be made by the number of squares (a square

being a unit of 100 square feet). The area of measurement for payment purposes for all work except as specified herein, will be the sum of the areas on horizontal planes produced by a vertical projection of the limits of the actual areas cleaned. The measurement for payment for hand cleaning the side excavation slopes of the conduit will be the actual area of the slopes as determined by field surveys. Payment for cleaning of rock surfaces upon which concrete is to be placed is included under the applicable concrete item.

3-09. PAYMENT. - No payment will be made for excavation specified or indicated to be under other items of work.

a. Unclassified Excavation, General. - Unclassified excavation, general, as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-08 above, will be paid for at the contract unit price per cubic yard for Item 3, "Unclassified Excavation-General". Such payment shall constitute full compensation for all work in connection with excavating, hauling, stripping, grading, stockpiling, rehandling from stockpiles, drainage, dewatering and pumping not paid for under other items, grading spoil areas, placement of materials in spoil areas, the stabilization of construction slopes and all other work specified herein in connection with unclassified excavation, general. Payment of Item 3, "Unclassified Excavation-General" shall not include payment for lowering the water table and dewatering for the dam foundation cutoff, foundation drain and removal of 12-inch cast iron water main through the dam foundation, which is to be paid for as part of the contract lump sum price for Item 2, "Control and Diversion of Water". No separate payment will be made for stripping in areas where stripping is not required, in order to obtain topsoil material, all costs in connection with this work being subsidiary to the contract unit price for Item 49, "Topsoiling, Rehandle and Place".

b. Unclassified Excavation, Borrow. - Unclassified excavation, borrow, as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-08, above, will be paid for at the contract unit price per cubic yard for Item 4, "Unclassified Excavation-Borrow". Such payment shall constitute full compensation for all work in connection with clearing, stripping, excavations, hauling, disposal of spoil materials, grading, drainage, stockpiling, and rehandling of stockpiled materials, the spreading of stripping material, fertilizing, seeding and mulching in the excavated areas, and all other work specified in connection with unclassified excavation, borrow.

c. Rock Excavation. - Rock excavation as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-08, above, will be paid for at the contract unit price per cubic yard for Item 5, "Rock Excavation". Such payment shall constitute full compensation for all work in connection with drilling, blasting, excavation, hauling to project features, processing plants or

spoil areas, stockpiling of unprocessed rock excavation and re-excavation from the stockpiles, cleaning excavated surfaces, except hand cleaned rock surfaces, scaling, breaking of rock to specific sizes and all other work specified herein in connection with rock excavation which is not paid for under other items. Such payment shall not include compensation for the processing of material from rock excavation for the production of rock slope protection material in accordance with the provisions of Section 6, "ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL".

d. Hand Cleaned Rock Surfaces. - Hand cleaned bedrock surfaces as defined and covered in this section of the specifications and measured in accordance with the provisions of Paragraph 3-08, above, will be paid for at the contract unit price per square (100 square feet) for Item 7, "Hand Cleaned Bedrock Surfaces". Such payment shall constitute full compensation for scraping, cleaning, washing, sweeping, cleaning with jets, all work in excess of that usually required for unclassified excavation, general, and rock excavation, and all work required to obtain the specified results. Such payment shall also include all costs in connection with filling joints and cracks in bedrock surfaces with mortar as specified in Paragraph 5-05b, including furnishing of all cement, sand and water, mixing and placing of mortar and removal of excess mortar from surfaces, and all other incidental work required for filling the cracks and joints. Such payment shall not include compensation for the preparation of rock surfaces upon which concrete is placed.

SECTION 4

GRAVEL BASE AND SURFACE COURSES
(Item 44)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
4-01	Scope	4-1
4-02	Formation of Subgrade	4-1
4-03	General	4-1
4-04	Measurement	4-1
4-05	Payment	4-1

SECTION 4

GRAVEL BASE AND SURFACE COURSES
(Item 44)

4-01. SCOPE. - This section covers the gravel base course for bituminous concrete pavements and for bituminous treated surfaces and gravel surface courses for roadway, shoulders and driveways. This section does not cover road gravel which is specified in Section 6, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL.

4-02. FORMATION OF SUBGRADE. - The area of the roadbed upon which the gravel base and surface courses, including shoulders, are to be placed shall be known as the subgrade. These areas shall be prepared for reception of the gravel base and surface courses as specified in Section A-8 of the Massachusetts Standard Specifications.

4-03. GENERAL. - Gravel base and gravel surface shall conform to Section B-1 of the Massachusetts Standard Specifications.

4-04. MEASUREMENT. - Measurement of gravel for base and surface courses and for shoulders will be made by the cubic yard of material acceptably placed to the compacted depth and to the width as shown on the plans or directed by the Contracting Officer.

4-05. PAYMENT. - Payment will be made at the contract unit price per cubic yard for Item No. 44, "Gravel for Base and Surface Courses and Shoulders", which price shall include furnishing all materials and performing all work specified in this section including formation of subgrade, furnishing and placing of all materials, tools, equipment and labor incidental thereto.

SECTION 5

EMBANKMENTS - DAM AND DIKE
(Items 7, 10 thru 15, Incl., 18, and 23A)

INDEX

Paragraph No.	Paragraph Title	Page No.
5-01	Scope	5-1
5-02	Definitions	5-1
	a. Embankment	5-1
	b. Backfill	5-1
	c. Compacted Backfill	5-1
	d. Special Impervious Fill	5-1
5-03	General Provisions	5-2
	a. Lines and Grades	5-2
	b. Conduct of Work	5-2
	c. Haul Roads	5-3
5-04	Materials	5-3
	a. General	5-3
	b. Impervious Fill	5-5
	c. Random Fill	5-5
	d. Sand Fill	5-5
	e. Gravel Fill	5-5
	f. Processed Sand Fill	5-6
	g. Backfill	5-6
5-05	Preparation of Foundation	5-6
	a. Earth Foundation for Embankments	5-6
	b. Bedrock Foundations for Embankments	5-7
	c. Backfill	5-8
5-06	Placement of Fill Materials	5-8
	a. General	5-8
	b. Rate and Sequence of Placement	5-8
	c. Impervious Fill	5-9
	d. Random Fill	5-9
	e. Gravel Fill, Sand Fill and Processed Sand Fill	5-9
	f. Spreading	5-10

Paragraph No.	Paragraph Title	Page No.
5-07	Moisture Control of Compacted Fill Materials	5-11
	a. Compacted Impervious and Random Fills	5-11
	b. Compacted Sand, Gravel and Processed Sand Fills	5-12
5-08	Compaction of Fill Materials	5-12
	a. Equipment	5-12
	b. Compacted Impervious and Random Fills	5-13
	c. Special Impervious Fills	5-14
	d. Compacted Sand, Gravel and Processed Sand Fill	5-14
	e. Additional Rolling	5-14
5-09	Initial Fill on Bedrock	5-14
5-10	Special Impervious Fill	5-15
	a. Walls and Steep Bedrock Surfaces	5-15
	b. Depressions in Bedrock Surfaces	5-15
5-11	Backfills	5-16
	a. General	5-16
	b. Compacted Impervious Backfill	5-16
	c. Compacted Gravel Backfill	5-17
5-12	Slides	5-17
5-13	Measurement	5-17
	a. Compacted Fills	5-17
	b. Backfill	5-17
	c. Special Impervious Fill	5-17
	d. Mortar and Concrete for Foundation Preparation	5-18
	e. Additional Rolling	5-18
5-14	Payment	5-18
	a. Compacted Fill	5-18
	b. Backfills	5-19
	c. Special Impervious Fill	5-19
	d. Mortar and Concrete for Foundation Preparation	5-19
	e. Additional Rolling for Compaction	5-19

SECTION 5

EMBANKMENTS - DAM AND DIKE
(Items 7, 10 thru 15, Incl, 18, and 23A)

5-01. SCOPE. - The work covered by this section consists of furnishing all plant, labor, equipment, and appliances, and of performing all operations in connection with the preparation of foundations for embankments and backfills and the placement and compaction of all materials, in the embankments and backfills, except as hereinafter provided, and in strict accordance with the contract drawings and specifications and subject to the terms and conditions of the contract. The provisions in this section of the specifications are applicable for portions of the dam and dike embankments constructed of rock slope protection, topsoil, road gravel, gravel bedding, bubble gage shelter fill, gravel base and pavement except as otherwise specified in Section 6, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL, Section 13, BUBBLE GAGE SHELTER, and in other sections of these specifications. This section does not cover the embankments, fills and backfills for the highway relocation, access road, turnarounds, culverts, drains and appurtenant structures which are covered in Section 5A, HIGHWAY FILL, and Section 11, EXCAVATION, TRENCHING AND BACKFILLING FOR CULVERTS AND DRAINS.

5-02. DEFINITIONS. - a. Embankment. - The term "embankment" as used in this section of the specifications is defined as including all portions of the dam and dike, (including Sutcliffe Road) exclusive of backfills and concrete structures, between the top of dam or dike, the outer slope lines, and the foundation surfaces after stripping and required excavations. The foundation cut-off, the foundation drain and the refilling of the excavation for the removal of the existing 12-inch cast iron water main through the dam foundation area are considered as part of the dam embankment under this definition.

b. Backfill. - The term "backfill" as used herein is defined as fill material placed adjacent to or over concrete structures and elsewhere in areas (1) where heavy or large equipment is not permitted to operate in order to avoid damage to these structures, and (2) where heavy or large equipment cannot operate due to space limitations. The types of backfill include "compacted impervious backfill" and "compacted gravel backfill".

c. Compacted Backfill. - The term "compacted backfill" as used herein is defined as backfill material deposited in thin layers and compacted with power tampers or surface vibrators as specified. All backfill material shall be compacted unless otherwise directed or designated on the drawings.

d. Special Impervious Fill. - The term "special impervious fill" is defined as impervious fill adjacent to certain steep surfaces of walls and bedrock and in depressions in bedrock surfaces which is composed of impervious fill material placed in thin layers by hand and compacted with power tampers in order to insure a very tight contact between the fill and the structure or bedrock surface and to insure satisfactory compaction of the fill material in the vicinity of the surface. Special impervious fill is the same as compacted impervious backfill except that (1) the operation of heavy compaction equipment shall extend into the zone of special impervious fill during the compaction of the adjoining fill material and (2) that heavy construction equipment may operate within that zone.

5-03. GENERAL PROVISIONS. - a. Lines and Grades. - (1) General. - The embankment sections and backfill sections shall be constructed to the lines, grades and cross sections indicated on the drawings or as defined herein unless otherwise directed by the Contracting Officer. All fills and backfills shall extend to the bottom and the slopes of an excavation regardless of the location of the payment or excavation lines shown on the drawings. The Government reserves the right to increase or decrease the foundation widths or the slopes of any embankments, or to make such other changes in the fill and backfill sections as may be deemed necessary to produce safe and satisfactory structures or to utilize materials available from required excavations to the maximum extent possible. Increases in the height of embankment to compensate for shrinkage or consolidation of the embankment materials subsequent to completion of the embankment will not exceed five (5) percent of the height above the foundation indicated on the drawings. Changes in quantity of materials resulting from prescribed changes in section shall not be made cause for claims for increased unit prices.

(2) Gravel Fill on Bedrock. - It is anticipated that in certain areas the bedrock surface upon which compacted gravel fill is to be constructed may be too uneven for the practicable construction of a layer of the thickness indicated on the drawings. During the progress of the work, the Contracting Officer will establish the grades and elevations of the surface of the compacted gravel fill in such areas so as to provide a layer thickness as near as practicable to that indicated. These limits will be established so that at least 12 inches of gravel fill will be constructed over the high points of the rock surface.

b. Conduct of Work. - The contractor shall maintain and protect all excavations, foundation areas, backfills, and uncompleted portions of the embankment in a satisfactory condition and at all times until final completion and acceptance of all work under the contract. Any approved fill or backfill material which is lost in transit or rendered unsuitable after being placed in a fill or backfill section and before final acceptance

of the work shall be replaced by the contractor in a satisfactory manner and no additional payment will be made therefor. The contractor shall excavate and remove from sections of fill and backfill any material which the Contracting Officer considers objectionable and shall also dispose of such material and refill the excavated area as directed, all at no cost to the Government. The contractor may be required to remove, at his own expense, any material placed outside of the prescribed slope lines.

c. Haul Roads. - Haul roads shall be located and constructed as approved by the Contracting Officer. They shall be designed to maintain the intended traffic, to be free draining and shall be maintained in good condition throughout the contract period, unless otherwise directed by the Contracting Officer. The contractor may not use materials from required and borrow excavations for the construction of haul roads and construction areas except those materials specifically designated to be placed in spoil areas. No separate payment will be made for the construction of haul roads and other work incidental thereto, the cost of which will be considered as a subsidiary obligation of the contractor.

5-04. MATERIALS. - a. General. - (1) Materials from required excavations and borrow excavations. - Materials for random and impervious fills and impervious backfills shall be obtained from the required excavations for the dam and dike and from the borrow area indicated on the drawings. The intention is to utilize suitable material from the required excavations to the extent possible so as to minimize the need for required borrow. Except as stated in Section 3, EXCAVATION, material to be spoiled will be specifically designated by the Contracting Officer at the time the material is excavated. Materials containing brush, roots, sod, humus or other perishable materials will not be considered suitable. Materials otherwise suitable except for roots shall be used for fill or backfill after the roots are removed. The suitability of the fill materials shall be subject to the approval of the Contracting Officer and their disposition in fill and backfill sections will be as directed by the Contracting Officer. The contractor shall excavate in the borrow area in the locations determined by the Contracting Officer whenever such control is necessary to obtain the type of material required for the embankments. If directed by the Contracting Officer, the contractor shall excavate pits within the limits of the borrow area and areas adjacent thereto for the purpose of exposing material, at no additional cost to the Government. Mixing of materials during the excavating process in the borrow area and the required excavations may be required to the extent possible with the type of equipment being used. No source of material will be rejected as the result of the material in place containing oversize stones. Oversize stones in fill and backfill materials, as defined in other paragraphs in this section, shall be removed from the materials prior to compaction or during placement where compaction is not required.

(2) Materials furnished by contractor. - The following standards of the American Society for Testing and Materials form a part of this specification for materials to be furnished by the contractor:

D75-59	Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials.
C136-63	Test for Sieve or Screen Analysis of Fine and Coarse Aggregate.
D421-58	Dry Preparation of Soil Samples for Grain Size Analysis and Determination of Soil Constants.
D422-62T	Grain Size Analysis of Soils.

Materials for use as sand fill, gravel fill, gravel backfill, and processed sand fill shall consist of approved materials furnished by and at the expense of the contractor. These materials shall consist of tough durable particles and shall be reasonably free from thin, flat and elongated pieces and shall contain no organic matter, sod, roots, brush, debris or soft friable particles in quantities considered objectionable by the Contracting Officer. The sources from which the contractor proposes to obtain any of the materials covered in this subparagraph shall be selected well in advance of the time when the material will be required in the work. Unless otherwise directed, suitable samples of the material for testing from any source selected by the contractor shall be submitted to the Contracting Officer for approval prior to the delivery of the material to the site of work from the source. Unless otherwise specified, all test samples for material shall be obtained by the contractor and delivered at his expense to a point designated by the Contracting Officer at least 30 days in advance of the time when the placing of the material is expected to begin. Sampling of the materials shall be done by the contractor in accordance with ASTM D75-59 at his own expense and in the presence of a representative of the Contracting Officer. The samples shall be subjected to such tests as are necessary to determine the acceptability of the material for use in the work unless suitable test reports and/or service records are available that are satisfactory to the Contracting Officer. The Contracting Officer shall be the sole judge as to the acceptability of the materials. All tests will be made by, or under the supervision of the Government and at its expense. The approval of a material by the Government, based on test results, examination of the materials exposed at the source, and service records shall not relieve the contractor, in any way, of the responsibility of placing a material which meets the requirements specified herein. Approval of a material from a source shall not be construed as approval of all materials from that source. The right is reserved to reject, at any time, any or all portions of the materials in the source when such materials are unsuitable in the opinion of the Contracting Officer. During or after placement of contractor furnished materials, test samples will be taken and tested to determine gradations of the materials in accordance with ASTM C136-63, D521-58 and D422-62T. Such sampling and testing will be done by the Government. All or any portions of contractor

furnished material placed which are not of approved quality or which do not have the specified gradation shall be removed at no additional cost to the Government. The loading and hauling of any contractor furnished material shall be performed in a manner that will prevent segregation and will assure placement of well graded material.

b. Impervious Fill. - Impervious fill material to be used in the construction of the dam embankment shall consist of approved material obtained from those portions of the borrow area as specified in Section 3, EXCAVATION. Impervious fill material shall consist of relatively well graded soil in which at least 30 percent, by dry weight of the particles passing the No. 4 U.S. Standard Sieve shall pass the No. 200 U.S. Standard Sieve.

c. Random Fill. - Random fill material for use in the dike embankment shall consist of approved materials obtained from the required excavations for the dam and dike. Random fill material for use in the construction of the dam embankment shall consist of approved materials obtained from the required excavations for the dam and from those portions of the borrow area as specified in Section 3, EXCAVATION. Impervious fill material may be used in the upper portion of the random fill zone of the dam embankment if a sufficient quantity of random fill material is not available in the borrow area.

d. Sand Fill. - Sand fill material for use in the construction of the dam and dike embankments shall be approved material consisting of reasonably well graded bank-run sand or gravelly sand furnished by the contractor from which all oversize stones, as defined by Subparagraph 5-06f(1) have been removed either at the source or during spreading. Sand fill material shall conform to the following gradation requirements.

(1) Of the component of the material passing the 3-inch U.S. Standard Sieve, not less than 50 percent by dry weight, shall pass the No. 4 U.S. Standard Sieve.

(2) Of the component passing the No. 4 U.S. Standard Sieve, between 15 and 100 percent by dry weight of the particles shall pass the No. 40 U.S. Standard Sieve, and not more than 10 percent by dry weight of the particles shall pass the No. 200 U.S. Standard Sieve and not more than 3 percent by dry weight of the particles shall have a diameter of less than 0.01 millimeters.

e. Gravel Fill. - Gravel fill material shall be approved material consisting of reasonably well-graded bank-run sandy gravel or gravelly sand furnished by the contractor from which all oversize stones, as defined in Subparagraph 5-06f(1), have been removed either at the source or during spreading. Gravel fill material shall conform to the following gradation requirements:

(1) Gravel fill material shall not contain more than 50 percent, by dry weight, of stones larger than 3 inches in maximum dimension.

(2) Of the component of the material passing the 3-inch U.S. Standard Sieve, at least 25 percent and no more than 60 percent, by dry weight, of the particles shall pass the No. 4 U.S. Standard Sieve.

(3) Of the component of the material passing the No. 4 U.S. Standard Sieve not more than 10 percent, by dry weight, of the particles shall pass the No. 200 U.S. Standard Sieve and not more than 3 percent, by dry weight, of the particles shall have a diameter of less than 0.01 millimeters.

f. Processed Sand Fill. - Processed sand fill material shall consist of approved material furnished by the contractor meeting the gradation specification for fine concrete aggregate as provided in Section 9, CONCRETE.

g. Backfill. - Materials for impervious and gravel backfills shall be obtained from the same sources and shall meet all requirements for materials as specified for the corresponding fill materials except that the maximum stone sizes will be as specified in Subparagraph 5-06f(1) of this section.

5-05. PREPARATION OF FOUNDATION. - a. Earth Foundations for Embankments. - This paragraph covers the preparation of the foundation areas for the dam and dike embankments to be constructed on earth foundations. After stripping to approved depths of each area of the embankment foundations as required, the sides of stump holes, previous excavations, and other similar cavities or depressions within the stripped area shall be broken down so as to flatten out the slopes and the sides of the cuts or holes except in the areas of the excavations for the foundation cutoff, foundation drain and for removal of the existing 12-inch cast iron water main through the dam foundation. Each depression in the foundation area of the compacted impervious fill section and the compacted random fill section shall be filled with impervious fill material and random fill material, respectively. The impervious and random fill material shall be placed in layers, moistened, and compacted in accordance with the applicable provisions of Paragraphs 5-06, 5-07, and 5-08 of this section. After filling of depressions and immediately prior to placement of embankment material in areas outside the limits of the foundation cut-off, foundation drain and excavation for the water main through the dam foundation, the foundation soil shall be loosened thoroughly by scarifying, plowing, or harrowing to a depth of 8 inches, except where the slope of the foundation surface is steeper than 1 vertical on 4 horizontal and except in areas where this requirement is waived by the Contracting Officer. After the

removal of roots and other debris turned up by the loosening process, the loosened surface of the embankment foundation area shall be completely dewatered and shall be compacted by 10 complete passes of the compaction equipment as hereinafter specified for the compaction of impervious and random fill material. Where the slope of the foundation surface is steeper than 1 vertical on 4 horizontal in areas outside the limits of the foundation cut-off, drain and excavation for water main, the foundation surface shall be compacted by the overlapping of the rolling of the contiguous horizontal layers of fill material onto it in such a manner as to produce a number of coverages of the foundation surface equal to at least twice that required for the adjacent fill material. No separate payment will be made for loosening, scarifying, dewatering, and rolling the foundation areas, but the entire cost thereof shall be included in the contract unit price for the adjacent embankment materials.

b. Bedrock Foundations for Embankments. - Bedrock surfaces upon or against which embankment materials are to be placed shall be cleaned in accordance with the provisions of Section 3, EXCAVATION. Prior to the placement of random and impervious material on or against bedrock, all open joints and cracks within the area of contact of hand cleaned surfaces shall be filled to the depths cleaned, with mortar. In areas of contact of hand-cleaned surfaces with impervious or random fill material where, in the opinion of the Contracting Officer, compaction cannot be accomplished by power tampers or other compaction equipment, such areas shall be filled with mortar or concrete, as directed, to the extent necessary to permit satisfactory use of the specified compaction equipment. In areas of contact of hand-cleaned surfaces with impervious or random fill materials where it is not practicable to remove overhands of the rock surface as specified in Subparagraph 3-07g(2), such areas shall be filled with concrete or mortar as directed. Concrete or mortar shall be used when necessary to provide for complete filling of the space beneath the overhang and to provide a non-overhanging surface flatter than 4 vertical on 1 horizontal, all as directed, against which impervious and random fill materials can be placed and compacted with the specified equipment. Mortar to be used as specified above, shall be composed of one (1) part of portland cement and two (2) parts aand. Concrete including forming to be used when specified above shall conform to the requirements of Section 9, CONCRETE. Sand for the mortar shall conform to Federal Specification SS-A-281b and shall have a gradation within the following limits:

U.S. Standard Sieve	Percent Passing by Dry Weight
No. 8	100
No. 16	95-100
No. 30	60-85
No. 50	20-50
No. 100	10-30
No. 200	0-5

Sand for mortar to fill cracks and joints greater than 1/2 inch in width may be as specified for fine concrete aggregate in Section 9, CONCRETE. The consistency of the mortar and the methods and devices used for the placement of mortar shall be such as to insure complete filling to the satisfaction of the Contracting Officer. In no case shall a thin coat of mortar be left to cover any portion of the bedrock surface. The foundation areas of the embankments shall be completely dewatered during placement of fill materials.

c. Backfill. - Prior to the placement of backfill material all mud, stones, lumber and other debris shall be removed from the foundation area to the satisfaction of the Contracting Officer and the foundation area shall be completely dewatered. Bedrock surfaces against which backfill materials are to be placed shall be prepared as specified in Subparagraph b, above for corresponding fill materials.

5-06. PLACEMENT OF FILL MATERIALS. - a. General. - The placement of rock slope protection, gravel bedding, and road gravel materials shall be in accordance with Section 6, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL and is not covered by this paragraph. No fill material shall be placed on any part of any embankment foundation area until the area has been inspected and approved by the Contracting Officer. No fill shall be placed against concrete structures until the concrete has been in place at least 14 days. No fill or backfill material shall be placed in any area inundated with water. The gradation and distribution of material throughout any fill section of the embankment shall be such that the section will be free from lenses, pockets, streaks, and layers of material differing substantially in texture or gradation from surrounding material in the same section. Successive loads of material shall be dumped at locations on the fill as directed or approved by the Contracting Officer. No fill material shall be placed upon a surface of frozen material, nor shall snow, ice, or frozen material be incorporated into any fill section. No fill material shall be placed on previously placed fill material which, in the opinion of the Contracting Officer has been affected by frost until the surface of the previously placed material has been loosened and recompacted as specified in Paragraph 5-05, above, for earth foundation preparation. No fill material shall be placed in an area within which compaction equipment is being operated. Layers of fill materials which are to be compacted shall be placed and spread over areas large enough to permit an orderly pattern for operating compaction equipment.

b. Rate and Sequence of Placement. - The dam and dike embankments shall be constructed in such a manner that the area of placement of materials will be approximately horizontal and shall extend for the full width and full length of the embankment at the elevation of the working surface regardless of the number of different fill materials required except as noted below. When portions of fill sections or complete fill

sections are constructed ahead of adjacent fills as permitted or required in accordance with the requirements below, the area of placement of materials will be approximately horizontal and will extend for the full width of the portion being constructed and for the full length of the embankment at the elevation of the working area.

(1) The zones of compacted gravel fill, compacted sand fill and compacted processed sand fill that comprise the horizontal drainage blankets of the dam and dike and dam foundation drain may be constructed ahead of the adjoining fills.

(2) All or a portion of the height of the initial compacted random fill section of the dam embankment below Elevation 730 may be constructed prior to the adjoining compacted impervious fill section, but after placement of compacted impervious fill in the foundation cutoff below approximately El. 695, in order that all approved available random fill material obtained from the required excavations for the dam, (including portions of the foundation cutoff and foundation drain) and portions of the spillway channel shall be utilized in the embankment construction.

(3) The fill material for the inclined compacted sand fill section of the dam shall be placed at least 1 foot and no more than 3 feet vertically in advance of the adjacent fill sections. To accomplish this, portions of the sand fill material may overlap as necessary into the adjoining fill area for a distance no greater than 5 feet.

c. Impervious Fill. - Impervious fill material shall be placed in the compacted impervious fill sections of the dam embankment including the foundation cutoff and the excavation for the water main through the dam foundation area upstream of the inclined sand fill section. In general, the more impervious material shall be placed toward the upstream side and the less impervious material toward the downstream side of the impervious fill sections.

d. Random Fill. - Random fill material shall be placed in the compacted random fill sections of dam and dike embankments. In general, the more impervious material shall be placed toward the reservoir side and the less impervious toward the downstream or landside of the random fill sections.

e. Gravel Fill, Sand Fill and Processed Sand Fill. - Gravel fill, sand fill, and processed sand fill materials shall be placed in the compacted gravel fill, sand fill and compacted processed sand fill sections, respectively, of the embankments indicated on the drawings. Care shall be exercised to prevent contamination of these materials during and after placement by material from adjacent fill sections.

f. Spreading. - (1) General. - This paragraph covers the requirements of spreading, placing and preparation of layers for compaction for fill materials, in general. Requirements for fill material to be placed in restricted areas and for special impervious fill materials are stated in the Subparagraphs (2) and (3), below. After dumping, the material for a fill section shall be spread by bulldozers or other approved means in approximately horizontal layers over the entire fill area, except that the layers of gravel fill, sand fill and processed sand fill material, may be placed and compacted on the abutment slopes prior to the construction of the adjoining fill where practicable. The thickness of each layer before compaction with a tamping type roller, rubber-tired roller, or tractor only shall not be more than 8, 12 and 6 inches, respectively. No fill material shall be dumped or spread with mechanical equipment within areas of "special impervious fill", or "backfill". As soon as practicable after commencement of construction of the embankment, the central portion thereof shall be raised or crowned with grades not to exceed 10 percent so that the surface of the fill will drain freely and shall be so maintained throughout construction. If the compacted surface of any layer of compacted fill is determined to be too smooth to bond properly with the succeeding layers, it shall be loosened by harrowing, or by any other approved method before the succeeding layer is placed hereon. During the dumping and spreading processes, the contractor shall maintain, at all times, a force of men and equipment adequate to remove all roots and debris from all fill materials and all stones with a maximum dimension greater than 2/3 of the thickness of the loose random or impervious fill layer from which the stones are being removed and all stones with a maximum dimension greater than the thickness of the loose layer of other fills from which the stones are being removed. Stones so removed shall be picked up on the fill area and shall be placed directly in the rock slope protection sections of the structures. Rock rakes or bulldozers shall not push the stone into place. At no time shall piles of oversize rocks be temporarily left within the limits of the foundation area and lines of the embankment. Roots and debris shall be removed from the embankment and disposed of in an approved manner. The entire surface of any section of an embankment under construction shall be maintained in such condition that construction equipment can travel on any part of any one section. Ruts in the surface of any layer shall be filled satisfactorily before compacting. Random, sand, gravel, and impervious fill materials are to be placed adjacent to walls and bedrock surfaces except where backfills or special impervious fill are shown on the drawings or as directed by the Contracting Officer. During the placement or spreading of fill material adjacent to walls or bedrock surfaces, special care shall be taken to place only friable fill material, free of clods, and nested stones within 18 inches of the wall and bedrock surface. At no time shall the surface of a layer of fill adjacent to special impervious fill be above the surface of the special impervious fill.

(2) Restricted Areas. - In areas such as ditches, depressions, excavated areas with limited widths which, in the opinion of the Contracting Officer, are too restricted for the operation of the required roller to compact the random, sand, processed sand, gravel or impervious fill materials, the fill material shall be placed as specified in Subparagraph (1) above, except that the thickness of layers shall not be greater than 4 inches and except as otherwise provided herein. These areas do not include areas defined in the following subparagraph.

(3) Special Impervious Fill. - The placing and spreading of special impervious fill material adjacent to certain walls and steep rock faces and the placing and spreading of initial layers of impervious fill material against certain areas of bedrock foundations shall be as specified in Paragraphs 5-09 and 5-10 of this section, respectively.

5-07. MOISTURE CONTROL OF COMPACTED FILL MATERIALS. - The materials in each layer of fill material to be compacted shall contain the amount of moisture, within the limits specified below or as directed by the Contracting Officer, necessary to obtain the desired compaction as determined by the Contracting Officer.

a. Compacted Impervious and Random Fills. - The moisture content shall be as uniform as practicable throughout any one layer of impervious or random fill material immediately prior to and during compaction. The upper and lower limits of moisture content shall be within 2 percentage points of the optimum moisture content as determined by the Contracting Officer. It is anticipated that some of the random and impervious fill materials will have natural moisture contents greater than the specified upper limit for placement. Drying back of impervious and random fill materials will be required by such methods as spreading the material on the fill area to dry, aerating the material by discing and harrowing either at the source or on the fill, excavating drainage trenches at the source, in accordance with Section 3, EXCAVATION or other methods that will reduce the moisture content to an amount within the specified limits. Prior to the placement of any fill material, the contractor shall place on the project at least one heavy-duty 24-inch road disc harrow similar to Model D36-1-F offset disc, manufactured by the Towner Manufacturing Company, Santa Ana, California. When the materials are too dry, the contractor will be required to moisten each layer of the fill. Disc harrowing, or other approved methods, will be required to work the moisture into the material until a uniform distribution of moisture is obtained. Water applied on a layer of fill shall be accurately controlled in amount so that free water will not appear on the surface during or subsequent to rolling. Should too much water be added to any part of the embankment, so that the material is too wet to obtain the desired compaction, the rolling and all work on that section of the embankment shall be delayed until the moisture content of the material is reduced to an amount within the specified limits. If, in the opinion of the Contracting

Officer, the top or contact surface of a partial fill section has become too dry to permit suitable bond between this surface and the additional fill material to be placed thereon, the contractor shall loosen the dried materials by scarifying or discing to such depths as may be directed by the Contracting Officer, shall dampen the loosened material to an acceptable moisture content, and shall compact this layer in accordance with the applicable requirements of Paragraph 5-08, below.

b. Compacted Sand, Gravel and Processed Sand Fills. - The moisture contents of materials for sand fill, gravel fill, and processed sand fill being compacted shall be such as to prevent excessive rutting and dust and to permit satisfactory operation of the hauling and compacting equipment.

5-08. COMPACTION OF FILL MATERIALS. - a. Equipment. - Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

(1) Tamping Rollers. - Tamping rollers shall consist of a heavy duty double drum unit with a drum diameter not less than 60 inches and an individual drum length of not less than 60 inches. The drums shall be water or sand and water ballasted. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each two square feet of drum surface. The tamping feet shall be 7 to 9 inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than 5 nor more than 7 square inches. The roller shall be equipped with cleaning fingers so designed and attached as to prevent the accumulation of material between the tamping feet, and these cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall be not less than 2500 pounds per foot of linear drum length weighted, and shall not be more than 1500 pounds per foot of drum length empty. The design and operation of the tamping roller shall be subject to the approval of the Contracting Officer who shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alterations in the roller, and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. At the start of compaction operations, the drums of the rollers shall be full of water. Placement of the embankment materials shall not commence unless every tamping foot of every roller to be used has a plane surface area as specified by the manufacturer of each roller. If, during the placement of fill the plane surface area of any tamping foot on a roller becomes equal to or less than two-thirds of the manufacturer's specified area, the use of the roller shall not be permitted until the plane areas of all tamping feet on the roller are restored to the manufacturer's specified area. The roller shall be pulled by a tractor of sufficient power to operate the roller at a speed of approximately 3 miles per hour.

(2) Rubber tired Rollers. - Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as can be maintained at tire pressures between 80 and 100 pounds per square inch for a 25,000 wheel load during rolling operations. The roller wheels shall be located abreast and be so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels will be such that the distance between the nearest edges of adjacent tire will not be greater than 50 percent of the tire width of single tire at the operating pressure for a 25,000 pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, as directed by the Contracting Officer, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed ten miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Contracting Officer.

(3) Crawler-Type Tractor. - A crawler-type tractor to be used in the compaction of gravel fill, sand fill, and processed sand fill layers as well as the compaction of random and impervious fill layers in restricted areas where it is impracticable to operate a roller, shall weigh not less than 20,000 pounds and shall exert a unit tread pressure of not less than 9 pounds per square inch.

(4) Power tampers. - Power tampers for the compaction of compacted backfill and special impervious fill shall be comercially manufactured pneumatic tampers approved by the Contracting Officer. Jackhammers and similar equipment not specifically designed and manufactured for the compaction of earth will not be approved.

(5) Surface Vibrator. - A surface vibrator for use in compacting gravel backfills shall be a commercial make of plate surface vibrator similar or equal to the Jackson Vibratory Compactor manufactured by the Electric Tamper and Equipment Company, Ludington, Michigan and approved by the Contracting Officer.

b. Compacted Impervious and Random Fills. - After a layer of impervious or random fill material has been dumped and spread, it shall be disc harrowed, if required, to break up and blend the fill materials, unless disc harrowing as specified under Paragraph 5-07 of this section is performed to obtain uniform moisture distribution. Disc harrowing shall be performed to a depth of at least 6 inches. When the moisture content and the condition of a layer is satisfactory, the lift shall be compacted by not less than 6 complete passes of the tamping roller or 4 complete passes of the rubber-tired roller, except as otherwise stated herein. A complete pass shall consist of the entire coverage of the area with one trip of the equipment specified. Each trip of the tamping roller shall overlap the adjacent trip not less than two feet. In no

case shall rollers be operated within zones of compacted backfill. A roller shall be operated to overlap the layers within zones of "special impervious fill" as specified in Paragraph 5-10. In areas such as ditches, depressions, excavated areas with limited widths or extents, which, in the opinion of the Contracting Officer, are too restricted for operations of a required roller to compact the fill material, the fill materials shall be placed as specified in Subparagraph 5-06g(2) and each layer shall be compacted by 6 coverages of the tread of the specified crawler-type tractor after the material in the layer is satisfactorily conditioned for moisture content. At the outer slopes of the embankment, special care shall be taken to insure the required compaction of all random and impervious materials prior to placement of gravel bedding materials. Dumping, spreading, moisture conditioning and compacting of a layer of fill material may be performed simultaneously, providing there is a sufficient total area to permit these operations to proceed in different areas of fill. The compaction operations shall be confined, until completed, to one area adequate in size for establishing an orderly pattern of rolling. No dumping, spreading or moisture conditioning shall be performed within the area being rolled during the period of the compacting operation.

c. Special Impervious Fills. - Special impervious fill material adjacent to certain walls and bedrock surfaces shall be compacted as specified in Paragraph 5-10 of this section.

d. Compacted Sand, Gravel and Processed Sand Fill. - After each layer of gravel fill material, sand fill material or processed sand fill material has been dumped and spread and its moisture content and condition determined to be satisfactory, it shall be compacted with 6 coverages of the tread of the specified crawler-type tractor.

e. Additional Rolling. - If, in the opinion of the Contracting Officer, the desired compaction of the material for any portion of compacted embankment fill is not secured by the minimum number of passes or coverages specified, additional complete passes or coverages shall be made over the surface area of such designated portion until the desired compaction has been obtained.

5-09. INITIAL FILL ON BEDROCK. - The areas of bedrock surfaces upon which or adjacent to which compacted gravel, impervious or random fill materials are to be placed shall be stripped and cleaned as specified in Section 3, EXCAVATION. The initial layer of gravel fill materials placed upon bedrock surfaces shall be as specified in Paragraphs 5-06, 5-07 and 5-08 of these specifications. During the placement of layers of random or impervious fill material, special effort shall be made to obtain compaction adjacent to and a tight contact with inclined bedrock surfaces using the rolling equipment, treads of tractors, or wheels of rubber-tired

equipment available at the site of the work. The open joints and cracks in the areas of bedrock surface upon or adjacent to which compacted impervious fill material is to be placed shall be filled with mortar as and where specified in Paragraph 5-05, above. Prior to the placement of a layer of impervious or random fill material which is to be compacted by the specified rollers or by the specified crawler-type tractor upon a bedrock surface, depressions, steps, or cavities in the bedrock surface, as selected by the Contracting Officer, within the contact area, shall be filled with mortar or concrete in accordance with Paragraph 5-05, above, or with special impervious fill in accordance with Paragraph 5-10 below. The initial layers of impervious and random fill material to be compacted by rolling placed upon bedrock surfaces shall be as specified in Paragraphs 5-06, 5-07 and 5-08 of these specifications.

5-10. SPECIAL IMPERVIOUS FILL. - a. Walls and Steep Bedrock Surfaces. - Special impervious fill material shall be placed adjacent to all walls within the contact areas of the surfaces of the walls and the compacted impervious fill sections and to steep bedrock surfaces at the sections shown on the drawings and at other locations as directed by the Contracting Officer. The special impervious fill material shall be placed and compacted in a manner to insure a very tight contact between the fill and the wall or bedrock surface and satisfactory compaction of the fill in the vicinity of the surface. The special impervious fill material shall be the same material and shall be placed, conditioned and compacted as specified for impervious backfill in Paragraph 5-11 of this section. The special impervious fill shall extend away from the wall or bedrock surface at least 12 inches into the area of operation of rolling equipment. The horizontal width of special fill will vary according to the unevenness and steepness of the wall or rock surface. The horizontal width of 2 feet shown on the drawings is for payment purposes only and does not indicate the actual widths that will be required. The special impervious fill material shall be placed and compacted to a height equal to the thickness of each of the adjoining fill layers prior to the placement of the adjoining fill layer. After placement of the adjoining fill layer, special impervious fill material shall not be placed until after compaction by rolling is completed along the wall or bedrock surface. During the rolling operation, the roller shall be operated as close to the wall or bedrock surface as possible, traveling parallel with the surface.

b. Depressions in Bedrock Surfaces. - Depressions, steps and cavities in the bedrock surfaces, as selected by the Contracting Officer, within the bottom of the foundation cut-off shall be filled with special impervious fill material as directed. Similar foundation areas of the compacted impervious material between the foundation cut-ff of the dam and the upstream limit of the compacted sand fill zone which have been hand-cleaned in accordance with Section 3, EXCAVATION, shall be filled with special impervious fill material to the extent considered necessary by the Contracting Officer to obtain satisfactory compaction in the initial compacted

impervious or random fill layers. The use of special impervious fill material shall be limited to the amount necessary to obtain a working surface and areas which will permit the placement and compaction of initial layers of compacted impervious or random fill material as specified in Paragraph 5-09, above. The special impervious fill material shall be the same material and shall be placed, conditioned and compacted as specified for impervious backfill in Paragraph 5-11, below. At steps in the bedrock surface, the special impervious fill will generally be placed and compacted to form a uniform slope of 4 horizontal on 1 vertical.

5-11. BACKFILLS. - a. General. - The various types of backfill materials shall be placed to the lines, grades, and cross-sections indicated on the drawings or as modified by the Contracting Officer within any other zones defined by the Contracting Officer, except as stated below. All backfill materials shall be compacted as stated herein. In excavated areas adjacent to concrete structures where the actual excavation slopes do not correspond with the payment limits shown on the drawings or as modified by the Contracting Officer, the backfill shall extend to the actual excavation slopes. Only equipment specified in this paragraph shall be used to place, spread, and compact backfill. No backfill material or other load shall be placed on or against surfaces of concrete structures for periods of 14 days after placing the concrete. The materials for impervious and gravel backfills shall be as specified in Paragraph 5-04 of this section for impervious and gravel fill materials respectively. The preparation of foundation for backfill shall be as specified in Paragraph 5-05.

b. Compacted Impervious Backfill. - The placement and compaction of impervious backfill material shall be in a manner that will produce satisfactory compaction and a tight contact of the backfill material with the adjoining concrete or bedrock surface. No impervious backfill material shall be placed in water or on a surface of previously placed backfill which has become soft due to rain, frost or other conditions. All soft material shall either be recompacted or removed as directed. The material for compacted impervious backfill shall be conditioned to provide a moisture content at time of compaction between optimum moisture content and 3 percentage points above optimum as determined by AASHO Standard Compaction Method No. T99-57, Method A. All stones greater than 3 inches in diameter shall be removed from the material during placement. Materials to be spread shall be piled outside the limits of the backfill area. The backfill shall be constructed by spreading material in layers 2 inches or less in thickness by hand shoveling. Each layer of material shall be compacted by at least 4 coverages of the tamping foot of an approved power tamper. At least two tampers shall be in operation for every laborer spreading the material. To insure the development of a tight contact of backfill material with concrete or rock surfaces, layers of material shall be placed to form a fillet adjacent to the surfaces. Each layer of the fillet shall be compacted with approved power tampers with the direction of tamping as near to perpendicular as practical to the concrete or rock surface.

c. Compacted Gravel Backfill. - The placement and compaction of gravel backfill material shall be in a manner that will produce satisfactory compaction and complete filling immediately adjacent to bedrock and concrete surfaces. Compacted gravel backfill material shall be spread by hand shoveling in approximately horizontal layers not exceeding 4 inches in thickness and each layer shall be compacted either by 4 coverages of the tamping foot of an approved power tamper or by an approved surface vibrator of standard commercial make. If a vibrator is used, the base of the vibrator shall be in contact with each square foot of the surface of the layer being compacted for a period of at least 20 seconds. All stones having maximum dimensions greater than 4 inches shall be removed from the layer prior to compaction by either method.

5-12. SLIDES. - In the event of slides in any part of the embankment prior to final acceptance of the work, the contractor shall remove material from the slide area, as directed, and shall rebuild such portion of the embankment. In case it is determined that the slide was caused through the fault of the contractor, the removal and disposal of material and the rebuilding of the embankment shall be performed without cost to the Government; otherwise this work will be paid for at the applicable contract unit prices for borrow excavation and compacted fill or backfill.

5-13. MEASUREMENT. - a. Compacted Fills. - The quantities of compacted impervious, random, sand, gravel, and processed sand fills to be paid for will be the volumes computed from the applicable lines, grades, thicknesses, and limits shown on the drawings, specified herein, or as directed for the respective embankment sections. The limits of sections of the fills or materials which are not definite on the drawings or as stated in these specifications and which depend upon topography and field conditions shall be determined by field surveys. In areas where it is impracticable to place a layer of gravel fill of uniform thickness due to the unevenness of the foundation, the limits of the gravel fill layer shall be as determined by field surveys. In the embankment where the bubble gage shelter is to be constructed, the lines, grades, and limits of the sections of fill materials will be taken as being the continuations of the normal lines, grades, and limits on either side of the bubble gage shelter.

b. Backfill. - Compacted backfills at locations shown on the drawings will be measured for payment as the volumes computed from the applicable limits and payment lines indicated on the cross sections, shown on the drawings, as stated in these specifications or as otherwise established by the Contracting Officer. The measurements shall not include the volumes of compacted backfill material placed outside the excavation payment lines shown on the drawings. Backfill directed to be placed at locations not shown on the drawings will be measured as the actual volume of backfill in place.

c. Special Impervious Fill. - Special impervious fill placed against concrete walls will be measured for payment as a volume on the

basis of a zone of fill 2 feet thick measured horizontally with an area equal to the actual area of contact of the fill against the wall. Special impervious fill at locations shown on the drawings against steep bedrock surfaces will be measured for payment as a volume on the basis of a zone 2 feet thick with an area equal to the projection horizontally upon a vertical plane of the surface area against which special impervious fill has been satisfactorily placed. The plane on which the projection is made will be parallel to the centerline of the conduit for measurement of special impervious fill placed against the side rock excavation slopes. Special impervious fill directed to be placed against steep bedrock faces at locations other than shown on the drawings will be measured as the actual volume in place. Special impervious fill which is placed in depressions, steps and cavities in bedrock surfaces shall be measured for payment as the total volume in place as determined by field surveys made of the foundation areas of the depressions, steps and cavities prior to filling and surveys made of the finished surfaces after filling.

d. Mortar and Concrete for Foundation Preparation. - Mortar for filling cracks and joints in the bedrock surface in areas which are required to be handcleaned and to receive compacted impervious and random fills and impervious backfill in accordance with Subparagraph 5-05b will not be measured for separate payment. All other mortar and all concrete used in the preparation of bedrock foundations in areas to receive compacted impervious and random fill and impervious backfill in accordance with Subparagraph 5-05b will be measured for payment as the actual volumes of such mortar and concrete satisfactorily placed as determined by field surveys of the areas involved made prior to and after placement of the mortar or concrete.

e. Additional Rolling. - Additional rolling for compaction will be measured for payment on the basis of the number of roller hours the compaction equipment is operated in accomplishing the compaction specified in Paragraph 5-08 of this section.

5-14. PAYMENT. - a. Compacted Fill. - Compacted fills and materials, measured as stated in Subparagraph 5-13a above, satisfactorily placed and compacted, will be paid for at the applicable contract unit prices per cubic yard for Item No. 10, "Compacted Impervious and Random Fills", Item No. 15, "Compacted Sand Fill," Item No. 13, "Compacted Gravel Fill," and Item No. 12, "Compacted Processed Sand Fill." Such payments shall constitute full compensation for all work in connection with the preparation of the foundations of the embankments (other than that specified in Subparagraph d, below), the spreading, harrowing, conditioning for moisture, compacting, removal of objectionable material, and all other incidental work required for the construction, protection, and maintenance of embankment sections exclusive of compensation for the excavation and transportation of material from required excavations and from the borrow area. Payment of contract unit prices for "Compacted Gravel Fill", "Compacted Sand Fill" and "Compacted Processed Sand Fill" shall, in addition, include all costs of furnishing acceptable material and transporting it to the locations in which it is to be placed.

b. Backfills. - Compacted backfills measured as stated in Subparagraph 5-13b above, will be paid for at the applicable contract unit prices for Item No. 11, "Compacted Impervious Backfill", and Item No. 14, "Compacted Gravel Backfill". Such payment shall constitute full compensation for all work in preparation of the foundation of contact surfaces (other than that specified in Subparagraph d below) and the spreading, conditioning, and compacting of backfill material and all other operations incidental to the placement of backfill materials. The payment of contract unit price for Item No. 14, "Compacted Gravel Backfill" shall also include compensation for furnishing acceptable gravel backfill material and transporting to the locations in which it is to be used.

c. Special Impervious Fill. - Special impervious fill will be paid for at the applicable contract unit price per cubic yard for Item No. 11, "Compacted Impervious Backfill". Such payment shall constitute full compensation for the preparation of foundations or contacting surfaces (other than that specified in Subparagraph d below) and the spreading, conditioning, compacting and all other operations incidental to the placement of the special impervious fill materials.

d. Mortar and Concrete for Foundation Preparation. - No separate payment will be made for filling and sealing open joints and cracks in the bedrock surface in accordance with Subparagraph 5-05b, payment for which will be included in the contract unit price per square (100 square feet) for Item 7, "Hand Cleaned Bedrock Surfaces". Payment for all other mortar and all concrete used in the preparation of foundations and measured as stated in Subparagraph 5-13d will be made at the established contract unit price per cubic yard of $60.00 for Item 23A, "Concrete for Foundation Preparation". Such payments shall constitute full compensation for all labor, materials, forming, and the use of all tools and equipment required to complete the work, except the cement used in the concrete for foundation preparation which will be measured and paid for as specified cement in Section 9, CONCRETE.

e. Additional Rolling for Compaction. - Additional rolling for the compaction of fill materials will be paid for at the applicable contract unit price per equipment hour for Item No. 18, "Additional Rolling of Fill". Such payment shall constitute full compensation for all costs including hauling unit or prime mover, and shall be based on the number of hours the roller is in actual operation with no allowance for down or standby time.

SECTION 5A

HIGHWAY FILL
(Item 9)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
5A-01	Scope	5A-1
5A-02	Definition	5A-1
5A-03	General Provisions	5A-1
5A-04	Materials	5A-1
	a. General	5A-1
	b. Earth Fill	5A-2
	c. Rock Fill	5A-2
5A-05	Preparing Ground Surface for Fill	5A-2
5A-06	Placement of Fill Materials	5A-2
	a. General	5A-2
	b. Spreading	5A-3
5A-07	Moisture Control of Fill Materials	5A-3
5A-08	Compaction of Fill Materials	5A-4
	a. Equipment	5A-4
	b. Earth Fill	5A-4
	c. Rock Fill	5A-5
5A-09	Slides	5A-5
5A-10	Measurement	5A-5
5A-11	Payment	5A-5

SECTION 5A

HIGHWAY FILL
(Item 9)

5A-01. SCOPE. - The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, and appliances, and of performing all operations in connection with the preparation of foundations for highway fills and the placement and compaction of all materials for the formation of highway fills, except as hereinafter provided, in strict accordance with the contract drawings and specifications and subject to the terms and conditions of the contract. This section does not cover the construction of fills for the construction of the dike and the relocation of Munn Road and Sutcliffe Road which are covered in Section 5, "EMBANKMENTS, DAM AND DIKE". This section does not cover backfills for culverts, drains and appurtenant structures which are covered in Section 11, "EXCAVATION, TRENCHING AND BACKFILLING FOR CULVERTS AND DRAINS".

5A-02. DEFINITION. - The term "fill" as used in this section of the specifications is defined as a mass in the permanent construction composed of specified materials which have been placed in a specified manner, the total of which forms the embankment for a highway exclusive of gravel bedding, rock slope protection, topsoil, gravel base, pavement and backfill for construction of culverts, drains and appurtenant structures. Any material specified for formation of fill is termed herein as "fill material".

5A-03. GENERAL PROVISIONS. - The highway fill sections shall be constructed to the lines, grades and cross-sections indicated on the drawings or as defined herein unless otherwise directed by the Contracting Officer. The contractor shall maintain and protect all uncompleted portions of the fill sections in a satisfactory condition at all times until final completion and acceptance of all work under the contract. Any approved fill material which is lost in transit or rendered unsuitable after being placed in a fill section and before final acceptance of the work shall be replaced by the contractor in a satisfactory manner. The contractor shall excavate and remove from sections of fill any material which the Contracting Officer considers objectionable and shall also dispose of such material and refill the excavated areas ss directed, all at no cost to the Government. The contractor may be required to remove, at his own expense, any material placed outside of the prescribed slope lines.

5A-04. MATERIALS. - a. General. - The suitability of all materials covered herein shall be subject to the approval of the Contracting Officer and their disposition in the fill sections shall be as directed. The materials shall be free of muck, trees, logs, stumps, standing or

matted brush, matted roots, rubbish, and frozen materials. The use of material obtained from required stripping operations in the foundation areas of fills and embankments will not be permitted.

b. Earth Fill. - Earth fill material for use in the construction of highway fills shall consist of suitable earth or friable disintegrated rock obtained from the required unclassified excavations of the highway and dam and from the unclassified excavations in Part 1 of the borrow area, except that no material from the borrow area suitable for use as impervious fill material will be permitted in the highway fill. Earth fill material containing topsoil or humus may be used provided that such material shall be dispersed throughout the fills in such a manner that there will be no continuous or consecutive layers of such material. Earth fill material shall contain no stones larger in greatest dimension than two-thirds the thickness of the layer in which it is to be placed, except that material placed in the top foot of a fill section shall contain no stones larger than 4 inches in greatest dimension.

c. Rock Fill. - Rock fill material for use in the construction of highway fills shall consist of suitable material containing 25 percent or more, by volume, or stones or rock fragments larger than 6 inches in greatest dimension, obtained from the required unclassified and rock excavations for the relocation of Wales Road and the access road and of oversize stones removed from the earth fill materials during placement. Rockfill material shall consist principally of rock fragments of less than 24 inches in maximum dimension.

5A-05. PREPARING GROUND SURFACE FOR FILL. - Sloped ground surfaces, steeper than 1 vertical to 4 horizontal, on which highway fill is to be placed, shall be plowed, stepped, or broken up, as directed, in such manner that the fill material will bond with the existing surface. Where the existing ground surface is not to be disturbed, all stump holes and other depressions shall be filled with earth and compacted prior to placing the overlying fill materials. Where the surface of an existing roadway, including shoulders, is less than 3 feet below the top of the highway fill, the existing road and shoulders shall be spiked and scarified for the full width of the roadbed sufficiently to permit uniform shaping, compaction, and bonding between the old material and the new.

5A-06. PLACEMENT OF FILL MATERIALS. - a. General. - No earth highway fill material shall be placed in any area inundated with water. No fill material shall be placed upon a surface of frozen material nor shall snow, ice, or frozen material be incorporated in any fill section. No fill material shall be placed on previously compacted fill material, which, in the opinion of the Contracting Officer, has been affected by frost until the surface of the previously placed material has been loosened and recompacted, as hereinafter specified. No fill material shall be placed in an area within which compaction equipment is being operated. Layers of fill materials shall be placed and spread over areas

large enough to permit an orderly pattern for operating compaction equipment. Highway fills shall be constructed in longitudinal reaches of at least 200 feet except at locations where the total length of the fill is less. Temporary construction and slopes shall not be steeper than 1 vertical to 3 horizontal. The top foot of all highway fills shall be constructed of the earth fill material specified in Subparagraph 5A-04b above. The remaining portions of the fill sections may be constructed of either earth fill or rock fill materials.

b. Spreading. - (1) Earth fill materials. - After dumping, earth fill material shall be spread by bulldozers or other approved means in approximately horizontal layers over the entire fill area. The thickness of each layer before compaction shall not be more than 8 inches when compaction is done with the tamping roller nor more than 6 inches when compaction is done with a crawler-type tractor. During the dumping and spreading operations, all stones having maximum dimensions greater than two-thirds the thickness of the layer being placed or, in the top foot of a fill section, greater than 4 inches shall be removed. Oversize stones thus removed may be incorporated in rock fill layers of the highway fill. Earth fill material placed in areas which in the opinion of the Contracting Officer are too restricted for the operation of the roller or tractor and in areas where the roller or tractor are not permitted to operate shall be spread in 4-inch layers by hand shoveling.

(2) Rockfill Materials. - Rockfill materials shall be placed in horizontal lifts extending the full width of the fill section. Lift thicknesses shall not exceed two feet. Materials containing rock shall be deposited on the material being compacted and shall be uniformly spread over the preceding layers by an approved crawler-type tractor. During the spreading operations, the finer rock materials shall be spread over the rock and these materials compacted with the approved crawler-type tractor. The spreading and rolling-in of the finer materials shall continue until the interstices are completely filled with well compacted materials and the entire layer is a densely compacted mass. Individual rocks not exceeding 48 inches in greatest dimension will be permitted provided such rocks are carefully distributed, solidly bedded, and all interstices filled with densely compacted finer materials as specified above, and provided the use of such larger rocks will not interfere with the general plan for placing the materials in horizontal layers having a maximum loose thickness of 24 inches. Where sufficient fines from the rock excavation are not available to fill the interstices, earth fill material shall be used.

5A-07. MOISTURE CONTROL OF FILL MATERIALS. - The moisture contents of the highway fill materials shall be such as to prevent excessive rutting and dust and to permit satisfactory operation of the hauling and compacting equipment.

5A-08. COMPACTION OF FILL MATERIALS. - a. Equipment. - Compaction equipment shall conform to the following requirements and shall be used as prescribed in subsequent paragraphs.

(1) Tamping Rollers. - Tamping rollers shall consist of a double drum unit with a drum diameter not less than 36 inches and an individual drum length of not less than 48 inches. The drums shall be ballasted with water or sand and water. Each drum shall have staggered feet uniformly spaced over the cylindrical surface such as to provide approximately three tamping feet for each two square feet of drum surface. The tamping foot shall be 7 to 9 inches in clear projection from the cylindrical surface of the roller and shall have a face area of not less than 5 nor more than 7 inches. The roller shall be equipped with cleaning fingers, so designed and attached as to prevent the accumulation of material between the tamping feet, and the cleaning fingers shall be maintained at their full length throughout the periods of use of the roller. The weight of the roller shall not be less than 1,000 pounds per foot of linear drum length weighted. The design and operation of the tamping roller shall be subject to the approval of the Contracting Officer who shall have the right at any time during the execution of the work to direct such repairs to the tamping feet, minor alterations in the roller, and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. At the start of compaction operations, the drums of the rollers shall be full of water. Placement of the embankment materials shall not commence unless every tamping foot of every roller to be used has a plane surface area as specified by the manufacturer of each roller. If, during the placement of fill, this plane surface area of any tamping foot on a roller becomes equal to or less than two-thirds the manufacturer's specified area, the use of the roller shall not be permitted until the plane areas of all tamping feet on the roller are restored to the manufacturer's specified area. The roller shall be pulled by a tractor of sufficient power to operate the roller at a speed of approximately 3 miles per hour.

(2) Crawler-type Tractor. - The crawler-type tractor used for the compaction of fill materials shall weigh not less than 20,000 pounds and shall exert a unit tread pressure of not less than 9 pounds per square inch.

(3) Power Tampers. - Power tampers for the compaction of earth fill materials in areas where the roller or tractor cannot operate shall be commercially manufactured pneumatic tampers approved by the Contracting Officer. Jackhammers and similar equipment not specifically designed and manufactured for the compaction of earth will not be approved.

b. Earth Fill. - After a layer of earth fill material has been satisfactorily spread, the layer shall be compacted by not less than 6 complete passes of the tamping roller or by not less than six coverages of the tread of the crawler-type tractor. A complete pass of

the tamping roller shall consist of the entire coverage of the area with one trip of the equipment. Each trip of the tamping roller shall overlap the adjacent trip by not less than two feet. In areas which are too restricted for the practicable operation of the roller or the tractor and in areas within which the roller or tractor are not permitted to operate each fill layer shall be compacted by four coverages of the foot of an approved power tamper.

c. Rock Fill. - Compaction of rock fill materials other than that incidental to the spreading operation specified in Paragraph 5A-06, above, will not be required.

5A-09. SLIDES. - In the event of slides in any part of the highway fills prior to final acceptance of the work, the contractor shall remove material from the slide areas as directed and shall rebuild such portion of the fill. In case it is determined that the slide was caused through the fault of the contractor, the removal and disposal of material and the rebuilding of the fill shall be performed without cost to the Government; otherwise, this work will be paid for at the applicable contract unit prices for borrow excavation and compacted fill.

5A-10. MEASUREMENT. - The quantity of highway fill to be paid for will be the volume computed from the applicable lines, grades, thicknesses and limits shown on the drawings, specified herein, or as directed, for the highway fill sections. The limits of fill sections which are not definite on the drawings or as stated in these specifications and which depend upon topography and field conditions shall be determined by field surveys. Measurement for highway fill will include the sections of earth fill and rock fill materials. The quantities shall not include the quantity of any fill or backfill paid for under other items.

5A-11. PAYMENT. - Highway fill measured as stated in Paragraph 5A-10 above, satisfactorily placed and compacted, will be paid for at the contract unit price per cubic yard for Item No. 9, "Compacted Highway Fill". Such payment shall constitute full compensation for all work in connection with the construction, protection and maintenance of the highway fills, exclusive of compensation for excavation and transportation of materials from required excavations and borrow area to the fill sections.

SECTION 6

ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL
(Items 16, 17 and 19)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
6-01	Scope	6-1
6-02	Materials	6-1
	a. General	6-1
	b. Rock Slope Protection	6-1
	c. Gravel Bedding	6-1
	d. Road Gravel	6-2
6-03	Foundation Preparation	6-2
	a. Embankment Foundation Areas	6-2
	b. Surface Base Areas	6-2
	c. Subgrade for Road Gravel	6-3
6-04	Rock Slope Protection	6-3
	a. General	6-3
	b. Placement	6-3
	c. Measurement	6-4
	d. Payment	6-4
6-05	Gravel Bedding	6-4
	a. General	6-4
	b. Placement	6-5
	c. Measurement	6-5
	d. Payment	6-5
6-06	Road Gravel	6-5
	a. General	6-5
	b. Placement	6-5
	c. Measurement	6-5
	d. Payment	6-5

SECTION 6

ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL (Items 16, 17 and 19)

6-01. SCOPE. - The work covered in this section of the specifications consists of furnishing all plant, labor, and materials, and performing all operations in connection with the construction of all sections and layers of rock slope protection, gravel bedding, and road gravel for the dam embankments, certain cut slopes and other project features in strict accordance with these specifications and the applicable drawings subject to the terms and conditions of the contract. This section does not cover base and surface courses for roads and driveways and roadway shoulders, which are covered in Section 4.

6-02. MATERIALS. - a. General. - All gravel bedding and road gravel materials shall be approved materials furnished by and at the expense of the contractor. All provisions of Section 5, "EMBANKMENTS, DAM AND DIKE", relative to contractor furnished materials shall be applicable to the gravel bedding and road gravel materials except as specified otherwise herein. The loading and hauling of any of the materials covered by this section of the specifications shall be performed in a manner which will prevent segregation and will assure placement of well-graded materials. Rock slope protection materials shall be placed directly in the rock slope protection layers and sections after processing without stockpiling.

b. Rock Slope Protection. - Rock slope protection material shall consist of hard, durable and sound stone or rock fragments obtained from the required rock excavations, processed as specified herein, and of oversize stones removed during placement of fill materials in the embankments. All loose earth shall be removed from oversize stones prior to placement in the rock slope protection layers and sections. The material obtained from the required rock excavations shall be processed to produce a well-graded material between the maximum size particle specified and the minimum size particle specified. The maximum size particle specified shall be that which can be placed in the layer or lift specified except that the volume of the maximum size stone shall not exceed 1/2 cubic yard. The larger size rock blocks shall be broken by secondary blasting. The minimum size particle specified shall be the smallest size fragment which will not pass a 6-inch bar grizzly. The processed rock slope protection material may contain up to 10 percent by weight of particles smaller than that specified above. Rock blocks for turnaround shall be 2' x 2' x 2' and placed as shown on the drawings.

c. Gravel Bedding. - Gravel bedding material shall be approved material consisting of reasonably well-graded bank-run sandy gravel or gravelly sand furnished by and at the expense of the contractor. Gravel bedding material shall conform to the following gradation requirements:

(1) The material shall contain no individual stone with a maximum dimension greater than 12 inches nor greater than one-half the thickness of the gravel bedding layer to be placed, whichever is less. The material shall not contain more than 50 percent, by dry weight, of stones larger than 3 inches in maximum dimension.

(2) Of the component of the material passing the 3-inch U. S. Standard Sieve, at least 25 percent and no more than 60 percent, by dry weight, of the particles shall pass the No. 4 U. S. Standard Sieve.

(3) Of the component of the material passing the No. 4 U. S. Standard Sieve, not more than 15 percent, by dry weight, of the particles shall pass the No. 200 U. S. Standard Sieve.

d. Road Gravel. - Material for road gravel shall be approved material consisting of natural bank-run, well-graded, sandy gravel or gravelly sand furnished by and at the expense of the contractor and meeting the following gradation requirements:

U. S. Standard Sieve Size	Percent Passing by Dry Weight
3-inch	100
No. 4	30-60
No. 200	2-10

6-03. FOUNDATION PREPARATION. - a. Embankment Foundation Areas. - The foundation areas of the dam embankment and highway fills upon which rock slope protection and gravel bedding are to be placed shall be stripped and prepared as specified in Section 3, EXCAVATION. No material shall be placed in any foundation area until the area has been inspected and approved by the Contracting Officer.

b. Surface Base Areas. - The surface areas of embankment sections of impervious, random, sand, gravel, and processed sand fills, highway fill and gravel bedding and areas produced by excavations outside of the limits of the foundations of the embankments, all upon which gravel bedding or rock slope protection materials are to be placed, shall be trimmed to conform to the lines and grades shown on the drawings, except as otherwise stated herein. The surface areas of embankment sections may have a tolerance of 4 inches in limited portions from the lines and grades shown on the drawings. Where surface base areas of natural earth or embankment sections of impervious, random, sand gravel, and processed sand fills are below the lines and grades shown on the drawings, the low areas shall be brought to grade either by (1) filling with material similar to the base material and placed and compacted, as directed, with pneumatic tampers or crawler-type tractors, or (2) by filling with the material to be placed on the area, and no additional payment will be made for any material or work thus required.

Immediately before the placing of any material, the prepared base shall be inspected and no material shall be placed thereon until the areas have been approved.

c. Subgrade for Road Gravel. - The entire subgrade surface, for road gravel, shall be compacted by 6 coverages of the tread of a crawler-type tractor or by other approved means. After compaction, the surface of the subgrade shall show no deviation in excess of 2 inches from the grades indicated on the drawings. No road gravel shall be placed on any subgrade area until the area has been inspected and approved by the Contracting Officer.

6-04. ROCK SLOPE PROTECTION. - a. General. - Rock slope protection material, as specified in Paragraph 6-02 of this section, shall be used to construct the rock slope protection layers and sections of the dam embankment, highway fills, on certain cut slopes, and at other locations indicated on the drawings. The furnishing and placing of rock blocks at turnaround is included under rock slope protection. No rock slope protection material shall be placed against concrete structures until the concrete has been in place at least 14 days. In placing the rock against concrete structures, care shall be taken to protect the concrete.

b. Placement. - Rock slope protection material shall be placed in such a manner as to produce a mass of rock with the minimum practical percentage of voids. The rock slope protection layers shall be constructed to the lines and grades shown on the drawings. A tolerance of plus or minus 6 inches from the slope lines and grades shown on the drawings will be allowed in the finished surface of the rock slope protection layers, except that either extreme of such tolerance shall not be continuous over an area greater than 200 square feet. Placement shall be in a manner which will not cause segregation of the particles and which will avoid displacement of gravel bedding materials. Placement by dumping into chutes, pushing by bulldozers, or by other methods likely to cause segregation, will not be permitted. The larger rock fragments shall be well distributed in the entire mass and the finished rock slope protection layers shall be free from segregation, objectionable pockets of small stones, and clusters of larger rock fragments. Oversize stones obtained from embankment fill materials and other materials shall be placed so that they will not appear on the finished surfaces of the rock slope protection layers. Rearranging of individual stones by hand or by mechanical equipment will be required to the extent necessary to obtain good distribution of stone sizes and to shape the surface within the specified tolerances and to obtain a uniform appearance throughout. Rock slope protection layers with horizontal widths greater than 10 feet shall be constructed in horizontal lifts of no more than 3 feet in thickness. Elsewhere rock slope protection material shall be placed to its full course thickness in one

operation. No bulldozer or similar equipment will be permitted to operate on the outer surfaces of rock slope protection layers. Placement of rock slope protection material on the dam embankment shall not lag behind by more than 3 feet measured vertically nor precede the placement of adjacent gravel bedding material. Voids in the surface of the rock slope protection layers within the limits of the 16-foot service road on the upstream face of the dam shall be filled prior to placement of road gravel with rock spalls or rock screenings produced in the preparation of rock slope protection. During the construction of the upstream rock slope protection layer on the dam embankment in the vicinity of the outlet works, provisions shall be made for the later installation of the bubble gage conduit and air vent. A trench shall be left open at the surface of the rock slope protection as shown on the drawings. Rock slope protection material shall be placed along the trench in such a manner that rock slope protection material may be placed later in the trench.

c. Measurement. - The quantity of rock slope protection to be paid for will be measured as the total volume computed from the lines, grades, thicknesses, and limits shown on the drawings or as modified by the Contracting Officer. The lower limits of the rock slope protection layers which are not definite on the drawings and depend upon field conditions and topography will be determined by a survey made immediately prior to placement of rock slope protection material. Each rock block placed at turnaround will be considered for payment purposes as measuring 8 cubic feet.

d. Payment. - Payment for rock slope protection will be made at the contract unit price per cubic yard for Item 19, "Rock Slope Protection". Such payment shall constitute full compensation for handling, cleaning, sorting, processing (including grizzlying), loading of processed material and hauling thereof to the permanent work, the loading of rock screenings and the hauling thereof to the permanent work or to the spoil areas, and placing of rock slope protection material, the shaping, grading, and working the outer surfaces including placement of rock screening on the outer surfaces beneath the service road, the breaking of oversize rock blocks, and all other work incidental to the construction of rock slope protection layers, exclusive of excavation, stockpiling, rehandling from stockpiles, hauling to processing plant, and all other work for which payment is made in accordance with Section 3, "EXCAVATION" and Section 5, "EMBANKMENTS - DAM AND DIKE". Furnishing and placing rock blocks at turnaround will be paid for under Item 19. Payment for the placement of rock slope protection material in the trench for the bubble gage conduit and the finishing of the rock slope protection surface in the trench area shall be included in the contract lump sum price for Item 27, "Bubble Gage Shelter".

6-05. GRAVEL BEDDING. - a. General. - Gravel bedding material as specified in Paragraph 6-02 of this section shall be placed to the lines, grades, thicknesses and limits shown on the drawings or as directed by the Contracting Officer to form the gravel bedding layers.

b. Placement. - Gravel bedding material shall be placed and spread uniformly on the prepared base, in a satisfactory manner, to provide a layer with the thickness shown on the drawings or as directed. Placing of material by methods which will tend to segregate particle sizes within the layer will not be permitted. Any damage to the surface of the gravel bedding prior and during placing of rock slope protection materials shall be repaired before proceeding with the work. Compaction of the gravel bedding will not be required but it shall be finished to present a reasonably even surface free from mounds or windrows. Placement of gravel bedding on slopes of the dam embankment sections shall not precede the placement of adjacent embankment fill material nor shall it lag behind by more than 5 feet measured vertically. During the placement of the gravel bedding on the upstream slope of the dam embankment in the vicinity of the outlet works, provisions shall be made for the later installation of the bubble gage conduit. In no case shall the gravel bedding that is to be placed after the installation of the bubble gage conduit be stockpiled on the completed portions of rock slope protection.

c. Measurement. - The quantities of gravel bedding to be paid for will be measured as the volumes computed from the respective lines, grades, thicknesses, and limits shown on the drawings or as directed by the Contracting Officer. The lower limits of the gravel bedding which are not definite on the drawings and which depend upon field conditions and topography shall be determined by surveys.

d. Payment. - Payment for gravel bedding will be made at the contract unit price per cubic yard for Item 16, "Gravel Bedding". Such payment shall constitute full compensation for furnishing, hauling, placing of gravel bedding, maintenance of the layers, preparation of foundations, and all other work incidental to the construction of the gravel bedding specified. No payment will be made for excess thicknesses of gravel bedding layers nor for material required to replace foundation material lost by rain wash, wind erosion, or otherwise, except for additional gravel bedding material ordered in writing by the Contracting Officer. Payment for the placement of gravel bedding in the trench area for the bubble gage conduit shall be included in the contract lump sum price for Item 27, "Bubble Gage Shelter".

6-06. ROAD GRAVEL. - a. General. - Road gravel material as specified in Paragraph 6-02 above, shall be placed to the lines, grades, thicknesses and limits indicated on the drawings or as directed by the Contracting Officer to form the road gravel section of the road across the top of the dam embankment and of the service road.

b. Placement. - After the subgrade is prepared in accordance with the provisions in Paragraph 6-03 above, the road gravel section shall be constructed by spreading the material in layers not exceeding 6 inches in thickness. The material as spread shall be well graded with

no pockets of fine material nor segregation of coarse and fine particles. After spreading, each layer shall be compacted with at least 6 coverages of the tread of a crawler type tractor weighing at least 20,000 pounds. The final surface of the road gravel shall be graded to provide a smooth even surface. In areas adjacent to the bubble gage shelter, the road gravel shall be compacted using a surface vibrator as specified in Paragraph 5-08a. The contractor shall maintain the final surface in a satisfactory condition until final completion and acceptance of all work under the contract.

c. Measurement. - The quantity of road gravel to be paid for will be measured as the volume computed from the thicknesses and limits indicated on the drawings or as modified by the Contracting Officer.

d. Payment. - Road gravel will be paid for at the contract unit price per cubic yard for Item 17, "Road Gravel". Such payment shall constitute full compensation for furnishing, hauling, placement, compaction, grading, and all other work incidental to the construction and maintenance of road gravel layers as specified.

SECTION 7

FOUNDATION DRILLING AND GROUTING
(Item 8)

(Index)

Paragraph No.	Paragraph Title	Page No.
7-01	General	7-1
	a. Scope	7-1
	b. Program	7-1
	c. Procedures	7-1
7-02	Equipment	7-1
	a. General	7-1
	b. Drilling Equipment	7-1
	c. Grouting Equipment	7-2
7-03	Grouting Materials	7-2
	a. Composition	7-2
	b. Water	7-2
	c. Cement	7-2
	d. Sand	7-2
7-04	Grout, Drainage and Exploratory Holes	7-3
	a. General	7-3
	b. Pipe for Foundation Grouting	7-4
	c. Pipe for Foundation Drains	7-4
	d. Grout Hole Drilling	7-5
	e. Drain Hole Drilling	7-5
	f. Exploratory Hole Drilling	7-6
7-05	Definitions and Procedures for Drilling and Grouting	7-6
	a. General	7-6
	b. Stage Grouting	7-7
	c. Washing and Pressure Testing	7-8
	d. Stage Grouting Procedures	7-8
	e. Grouting Pressures	7-9
	f. Grouting	7-9
	g. Records	7-11
	h. Communications	7-11

Paragraph No.	Paragraph Title	Page No.
7-06	Measurement and Payment	7-11
	a. General	7-11
	b. Mobilization and Demobilization	7-11
	c. Drilling Grout Holes	7-12
	d. Drilling Drain Holes	7-12
	e. Drilling Exploratory Holes	7-12
	f. Portland Cement in Grout	7-12
	g. Sand in Grout	7-12
	h. Placing Grout	7-12
	i. Connections to Grout Holes	7-13

SECTION 7

FOUNDATION DRILLING AND GROUTING
(Item 8)

7-01. GENERAL. - a. Scope. - This section of the specifications covers drilling exploratory holes; drilling drain holes; drilling, washing and pressure testing grout holes; making grout connections; furnishing, handling, transporting, storing, mixing and injecting the grouting materials; providing insulated pipe lines and a warmed enclosure for the grout plant to facilitate effective placement of grout during freezing weather; patching the finished grout holes; care and disposal of drill cuttings, waste water and waste grout; clean-up of the areas upon completion of the work and all such other operations as are incidental to the drilling and the grouting.

b. Program. - The work contemplated consists of constructing a grout curtain beneath the dam and spillway weir, the approximate locations, limits, and details of which are indicated on the contract drawings. All grouting shall be done from natural and excavated bedrock surfaces except for holes at the intersection of the cut-off trench and outlet works where field conditions or construction progress may require grouting through the concrete leveling course. The program shown on the drawings and described herein is tentative and is presented for the purpose of canvassing bids. The amount of drilling and grouting which actually will be required is unknown, and will be governed by conditions encountered as the work progresses. The grouting program will be initiated following cleanup of any area of the rock surface or surfaces of rock excavated to design grades as approved by the Contracting Officer. Cleanup shall be made in accordance with Paragraph 3-07 h. In no case will grouting be allowed closer than 50 feet to an area in which rock excavation or overburden excavation has not been completed to grade in order to facilitate the observation and calking of grout leaks.

c. Procedures. - Grouting mixes, pressures, the pumping rate and the sequence in which the holes are drilled and grouted will be determined in the field and shall be as directed.

7-02. EQUIPMENT. - a. General. - All drilling and grouting equipment used shall be of a type, capacity and mechanical condition suitable for doing the work, as determined by the Contracting Officer. The power and equipment and the layout thereof shall meet all applicable requirements of local, State, and Federal regulations and codes, both safety and otherwise.

b. Drilling Equipment. - Standard drilling equipment of the rotary, water circulating, diamond core drilling type shall be used to perform the drilling as specified in Paragraphs 7-04d through 7-04f.

c. Grouting Equipment. - The grout plant shall be capable of supplying, mixing, stirring and pumping the grout, to the satisfaction of the Contracting Officer. The plant shall have a minimum capacity of 30 g.p.m. of grout injected at a pressure not greater than 40 p.s.i. It shall be maintained in first-class operating condition at all times and any grout hole that is lost or damaged due to mechanical failure of equipment or inadequacy of grout supply shall be replaced by another hole, drilled by the contractor at his expense.

7-03. GROUTING MATERIALS. - a. Composition. - Grout will be composed of water and cement except when mortar grout is required as specified in Paragraph 7-05 f. The grout mixes will be designed by the Contracting Officer and will be varied to meet the characteristics of each hole as determined by conditions encountered. The various materials to be furnished by the contractor shall conform to the specifications listed in subparagraphs b, c, and d, below.

b. Water. - The water used in the grout shall be furnished by the contractor. It shall be fresh, clean and free from injurious amounts of sewage, oil, acid, alkali, salts, or organic matter.

c. Cement. - Cement used in grout shall conform to Paragraph 9-04b. The use of bulk cement will be permitted provided the contractor employs methods of handling, transporting, and storage that are satisfactory to the Contracting Officer; otherwise, only cement furnished in cloth or paper bags will be accepted to use in the work. A sufficient quantity of cement shall be stored at or near the site of the work to insure that grouting operations will not be delayed by shortage of cement. In the event the cement is found to contain lumps or foreign matter of a nature and in amounts which, in the opinion of the Contracting Officer, may be deleterious to the grouting operations, screening through a standard 100-mesh screen may be required. No payment will be made for such screening.

d. Sand. - Sand for grout shall consist of hard, tough, durable, uncoated particles. It may be composed of natural sand, manufactured sand, or a combination of natural and manufactured sand. The shape of the particles shall be generally rounded or cubical and shall not contain more than 15 percent of flat or elongated pieces having a maximum dimension in excess of five times the minimum dimension. If the sand is a combination of separately processed sizes or classification, or is a combination of natural and manufactured sands, the different components shall be batched separately or, subject to written approval, blended prior to delivery to the mixing plant. The sand shall be well graded from fine to coarse and the gradation, as determined in accordance with ASTM Designation C136-63, for "Sieve or Screen Analysis of Fine and Coarse Aggregates" shall conform to the following requirements:

Sieve Designation (U.S. Std. Square Mesh)	Cumulative Percentage by Weight	
	Passing	Retained
8	100	0
16	95-100	0-5
30	60-85	15-40
50	20-50	50-80
100	10-30	70-90
200	0-5	95-100

In addition to the grading limits shown above, all sand used in the work shall have a fineness modulus within the range of 1.50 to 2.00. The grading of the sand as delivered to the mixer, during any 24-hour period of operation, shall be controlled so that the fineness moduli of samples taken will not vary more than 0.10 from the average fineness modulus. The results of previous tests and the service record may be used to determine the acceptability of the sand. In the event previous tests and a service record are meager or not available, as in the case of newly operated sources, or are not satisfactory, the sand shall be subjected to such tests as are necessary to determine its acceptability. All sampling of sand shall be in accordance with the applicable sampling provisions contained in Federal Specification SS-R-406c(1)(Part 2) for "Road and Paving Materials; Methods of Sampling and Testing," or as directed. Unless otherwise directed, all test samples shall be taken under the supervision of the Contracting Officer and shall be delivered to a designated point, at the expense of the contractor, at least 60 days in advance of the time when sand will be required at the site of the work. All tests will be made by the Government at its expense. The tests to which the sand will be subjected will include specific gravity, absorption, soundness in magnesium sulphate, petrographic analyses, and any other tests that are necessary to demonstrate that mortar of adequate durability can be produced. The percentage of surface moisture in terms of the saturated surface-dried sand will be determined in accordance with ASTM C70-47 for "Standard Method of Test for Surface Moisture in Fine Aggregate", or other method giving comparable results. Sand shall be stored in auch a manner as to avoid inclusion of any foreign materials in the grout. The storage piles shall be constructed so as to prevent segregation. All sand shall remain in free draining storage for at least 72 hours prior to use.

7-04. GROUT, DRAINAGE AND EXPLORATORY HOLES. - a. General. - All holes for grouting, drainage, or exploration shall be drilled at the locations, in the direction and to the depths shown on the drawings or as directed by the Contracting Officer. The first series of holes to be drilled and grouted shall be at intervals shown on the drawings and hereinafter are referred to as primary holes. The location of secondary and succeeding series (intermediate) holes shall be determined by the split

spacing method as defined in Subparagraph 7-05a(4). The number of grout holes shall be increased progressively, by the split spacing method as deemed necessary by the Contracting Officer until the amount of grout used indicates that the foundation is tight. The use of grease, "rod dope", or other lubricant on rotary drill rods will not be permitted. Each hole drilled shall be protected from becoming clogged or obstructed by means of a cap or other suitable device on the collar and any hole that becomes clogged or obstructed before completion of operations shall be cleaned out in a manner satisfactory to the Contracting Officer or another hole provided by and at the expense of the contractor. That portion of drain holes which penetrates concrete shall be formed by embedding pipes in the concrete at the time of its placement, and no payment will be made for such partial depth of holes. Cost of furnishing and placing pipe shall be a subsidiary obligation included under the applicable contract price for drilling the holes.

b. Pipe for Foundation Grouting. - All metal pipe and fittings required for constructing grout, and exploratory holes shall be furnished, cut, threaded, fabricated and embedded by the contractor. The pipe shall conform to Fed. Spec. WW-P-406b for "Pipe; Steel, (Seamless and Welded (for Ordinary Use))" Weight A, Class 1. The fittings shall be malleable iron Type I in accordance with Fed. Spec. WW-P-521d & Am-1 for "Pipe-Fittings, Malleable Iron, Wrought Iron and Steel (screwed) 150-pound." Pipe will be black steel of the diameter and in the location indicated on the drawings. The pipe and fittings shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar immediately before embedment. All joints shall be made up snug and the assembly held firmly in position and protected from damage or displacement until grouting is completed. The contractor shall take all necessary precautions to prevent any pipe from becoming clogged or obstructed from any cause and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the contractor's expense. The presence of tramp metal such as nails, wire, bolts, nuts and other foreign material in the pipes through which diamond drilled holes are to be drilled shall be considered as obstructions. No separate payment will be made for the pipe and fittings as it will be considered a subsidiary obligation included under the applicable contract price for drilling the holes.

c. Pipe for Foundation Drains. - Asbestos cement pipe required for constructing drainage holes shall be furnished, cut, and embedded by the contractor. The pipe shall conform to Federal Specification SS-P-351a, "Pipe Cement Asbestos", Class 150. Pipe will be of the diameter and in the locations indicated on the drawings. The pipe shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar immediately before embedment, and should be held firmly in position and protected from damage or displacement while the concrete is being placed. The contractor shall take all necessary precautions to prevent any pipe from becomming clogged or obstructed from any cause, and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the contractor's expense.

The presence of tramp metal such as nails, wire, bolts, nuts and other foreign material in the pipes through which holes are to be drilled shall be considered as obstructions.

d. Grout Hole Drilling. - Grout holes shall be drilled with standard rotary, water circulating, diamond core drilling equipment. No core recovery will be required and the type bit used shall be optional with the contractor. The minimum diameter of hole shall be 1-1/2 inches at the point of maximum penetration. No grout hole will be drilled at an angle greater than 45 degrees measured from the vertical nor to a depth greater than 40 feet measured from the collar of the hole. If, as the work progresses, it is determined that holes to depths greater than indicated in the bid schedule are necessary, drilling to such greater depth will be ordered in writing, and the drilling to depths in excess of 40 feet will be paid for at a negotiated unit price. Drilling will be done in accordance with the "Stage Grouting, Split Spacing" method hereinafter described. Whenever the drill water is lost, or artesian flow is encountered, the drilling operations shall be stopped and the hole grouted before drilling operations are resumed in such hole. The grout so injected remaining in a partially completed hole shall be removed therefrom by washing or other methods before it has set sufficiently to require redrilling. Redrilling required because of the contractor's failure to clean out a hole before the grout has set shall be performed at the contractor's expense except that where the grout has been allowed to set by direction of the Contracting Officer, the redrilling will be paid for at the rate of 50 percent of the schedule price for drilling the grout hole.

e. Drain Hole Drilling. - Drainage holes shall be drilled into the dam foundation through pipes embedded in the concrete for this purpose. Drain holes shall be drilled with standard rotary, water circulating, diamond core drilling equipment, but no core recovery will be required and the contractor may use coring or noncoring bits as he may elect. The minimum diameter of hole shall be 2-7/8 inches measured at the point of maximum penetration. Drain holes shall be drilled at angles and to depths as indicated on the drawings unless otherwise specified or changed by the Contracting Officer due to conditions determined after the rock is exposed by construction operations. If as the work progresses, it is determined that holes to depths greater than indicated are necessary, drilling to such greater depth will be ordered in writing by the Contracting Officer, and drilling to depths in excess of 15 feet for 3-inch drain holes will be paid for at negotiated prices. All drain holes will be thoroughly washed after completion of drilling to remove all drill cuttings and slurry by applying water and air to the bottom of the hole and returning the water through the hole to the surface. Drain holes shall not be drilled without the written approval of the Contracting Officer in any location until all adjacent grout holes within a minimum distance of 150 feet have been drilled and grouted to full depth.

f. Exploratory Hole Drilling. - The contractor shall perform such exploratory drilling as may be required to determine the condition of the rock prior to grouting or the effectiveness of the grouting operations after grouting. Exploratory drilling may also be required in areas of structure foundations where other drilling or grouting is not planned. All exploratory drilling shall be performed with rotary, water circulating, diamond core drilling equipment using coring type bits. Since the maximum recovery of unpredictable soft or friable materials is of prime importance, the contractor shall use a standard ball bearing, swivel type, double tube core barrel equipped with diamond set core bits and standard core lifters, similar in construction and equal in performance to the Sprague and Henwood "M" series. The amount of, and the requirement for, exploratory drilling will be as directed. The NX holes may be required to be drilled to varying depths, with a maximum depth of 50 feet. Special care should be exercised to obtain cores in as good condition as possible from all holes capable of producing satisfactory cores. The contractor shall keep, in a manner satisfactory to the Contracting Officer, and furnish to the Contracting Officer an accurate Driller's Log of all exploratory holes drilled. The log shall include a non-technical description of all materials encountered in the drilling, their location in the holes and the location of special features such as seams, open cracks, soft or broken rock, points where abnormal loss or gain of drill water occurred, and any other items of interest in connection with the purpose for which the exploratory drilling is required. Wooden core boxes will be furnished by the Government, and the contractor shall place the cores in the boxes in the correct sequence and separated accurately by wooden blocks, according to the measured distances in the holes. No box shall contain cores from more than one hole. The covers shall be fastened securely to the core boxes and the boxes shall be delivered in the vicinity of the work as directed by the Contracting Officer. Exploratory holes may be grouted under pressure, if conditions so indicate, but in all such cases the holes will be grouted to full depth in one operation and the contractor will not be required to remove the grout from any part of the hole.

7-05. DEFINITIONS AND PROCEDURES FOR DRILLING AND GROUTING. -
a. General. - The drilling and the grouting shall be done by zones, using the split spacing, stage grouting method as described herein.

(1) Zone. - A zone is a predetermined partial depth of curtain. The first zone extends 15 feet downward from the rock surface except at the spillway weir where it extends downward 10 feet from foundation grade. At the weir and between Stations 1+25 and 3+50 along the cut-off trench this zone constitutes the full depth of the grout curtain. A second zone extends 10 feet downward from the bottom of the first zone between Stations 3+50 and approximately 7+15. It is anticipated that hole spacing will average 10 feet in both the first and second zones, for the grout curtain under the dam and 5 feet at the spillway weir. However, these spacings will be varied in accordance with conditions encountered and as directed. In general, all grouting in a given zone and section will be finished before work is started in the next underlying zone.

(2) Section. - A section is a reach along the grout curtain, not more than 50 feet in length in which grouting operations will not be permitted at the same time that drilling is in progress. Insofar as practicable the grout curtain will be subdivided into sections in a manner which will facilitate the contractor's operations.

(3) Stage. - A stage is a partial or complete depth of hole within any given zone. The actual depth of a stage depends upon geologic conditions encountered in drilling. It may vary from a fraction to the full depth of the zone, and is marked by the loss or gain of drill water in appreciable amounts.

(4) Split Spacing. - Split spacing is the procedure of locating an additional grout hole midway, between two previously drilled and grouted holes.

b. Stage Grouting. - Stage grouting is a complete cycle of drilling, washing, and grouting of any portion of a hole within a given zone. It involves the placement of a grout curtain by drilling and grouting in successive operations in accordance with the following general procedure.

(1) Primary holes for foundation grouting shall be drilled to comparatively shallow depths within the first zone. The depths will be governed by the foundation conditions.

(2) The holes thus drilled shall be washed and pressure tested, and then grouted, except that when pressure testing indicates a relatively tight hole, the Contracting Officer may direct that the grouting of that hole be omitted for that stage and the hole be left open for drilling and grouting of the next stage.

(3) After the grouting of any hole, the grout within the hole shall be removed by washing or by other methods before it has set sufficiently to require redrilling.

(4) After the interval of time as specified in Paragraph 7-05d(2), the primary holes not already drilled to the limit of the first zone shall be drilled as directed to additional depths not exceeding the zone limit.

(5) The primary holes thus deepened shall again be washed and pressure tested and then grouted at higher pressures as directed.

(6) Again, the grout within the hole shall be removed as described above.

(7) The process of successively drilling primary holes to additional depths and grouting at higher and higher pressures in stages, as directed, shall be repeated until all of the first set of holes on the

maximum spacing (see Paragraph 7-04a) have been completely drilled and grouted to the depth of the first zone over such section of the grout curtain as may be directed.

(8) After the primary holes in the first zone have been completed in any section as specified above, the second and succeeding series of holes, as determined by the "split spacing method", shall be drilled and grouted to the depth of the first zone in like manner until the first zone of that section is completely grouted as directed.

(9) The process of successively drilling to additional depths and grouting at higher and higher pressures in stages for the first series of holes and then for succeeding series of holes shall be repeated for the second zone of that section. Other sections along the grout curtain shall be grouted in like manner until grouting of the foundation is completed to the satisfaction of the Contracting Officer. As the drilling and grouting work progresses, it may develop that conditions are such that all or parts of the foundation already grouted require additional grouting. In such event, the equipment shall be returned and additional holes for grouting shall be drilled and grouted as directed and no additional allowance above the contract prices will be made for drilling and grouting such holes or for the expense of any movement of equipment necessary to the performance of such work.

c. Washing and Pressure Testing. - Immediately before the pressure grouting of each stage of any hole is begun, the hole shall be thoroughly washed under pressure and pressure tested. All intersected rock seams and crevices containing clay or other washable materials shall be washed with water and air under pressure to remove as much of these materials as possible. If practicable, as determined by the Contracting Officer, such material shall be ejected from one or more holes by introducing water and air under pressure into an adjacent hole. In no case shall such pressure exceed the maximum grouting pressure as directed. All grout holes shall be tested with clean water under continuous pressure up to the required grouting pressure as directed. All holes sufficiently tight to build up the maximum required pressure shall be washed at such pressure and the washing shall continue as long as there is any increase in the rate at which water is taken, such increase indicating that fractures are being opened by the washing operation. Open holes in which no pressure can be built up shall be washed for a period of 5 minutes, with the pump operating at full capacity, or for such period of time as fracture-filling is being removed, as evidenced by the escape of muddy water through surface openings or other grout holes.

d. Stage Grouting Procedures. - (1) First Stage. - The contractor shall perform the first stage, or low-pressure, shallow-curtain grouting by washing and grouting holes at locations indicated on the drawings or directed, using the "split spacing" method described in Paragraph 7-05a(4). Before grouting is begun in any hole of a given series in any section, at least the nearest two holes in advance of each such hole in that series shall be completely drilled for the same stage

and the adjacent hole completely washed to facilitate washing and flushing out of any intervening clay-filled seams, fractures, or solution channels.

(2) Second Stage. - After all first stage grouting in any section has been completed, as specified above, the contractor shall proceed, when so directed, with second stage drilling and grouting in accordance with the procedure outlined herein but in no case shall the deepening of any hole preparatory to grouting be commenced before a minimum period of 24 hours has elapsed since completion of the previous stage-grouting at that hole; nor shall second stage grouting be conducted within a distance of approximately 100 feet of any hole in which a previous stage of grouting has been completed until the grout in such previous stage hole has set for a period of 24 hours. Grouting at subsequent stages shall conform to the same requirements as to minimum time and distance.

e. Grouting Pressures. - Grouting pressures to be used in the work will vary with conditions encountered in the respective holes and pressures used shall be as directed. In general, an increase in pressure proportionate to the depth of hole applied from the top of the hole will be required. Under any condition, the maximum grouting pressure in any part of the work shall be limited to that which, as determined by the Contracting Officer, will not lift or otherwise move any part of the foundation of adjacent structures. In no event will pressures in excess of 40 p.s.i. be required.

f. Grouting. - All pressure grouting operations shall be performed in the presence of the Contracting Officer, and shall be in accordance with the following general procedures.

(1) Grout Mixes. - Mixes shall be in the proportions directed by the Contracting Officer who will, from time to time, direct changes to suit the conditions found to exist in the particular grout hole. The water-cement ratio by volume will be varied to meet the characteristics of each hole as revealed by the grouting operation and will range between 3.0 and 0.6; the greater part of the grout probably being placed at a ratio of about 1.0. The types of grout shall be as follows:

(a) Neat Cement Grout shall consist of cement and water.

(b) Mortar grout shall consist of cement, sand, and water.

(2) Grout Injection. - In general, if pressure tests indicate a tight hole, grouting shall be started with a thin mix. If an open hole condition exists, as determined by loss of drill water or inability to build up pressure during washing operations, then grouting shall be started with a thicker mix and with a grout pump operating as nearly as practicable at constant speed at all times; the ratio will be decreased,

if necessary, until the required pressure has been reached. If this procedure does not produce the desired pressure, mortar grout shall be used and the mix varied as necessary to produce the desired results. When the pressure tends to rise too high, the water-cement ratio shall be increased and/or the mix of mortar grout changed or discontinued as may be required to produce the desired results. If necessary to relieve premature stoppage, periodic applications of water under pressure shall be made. Under no conditions shall the pressure or rate of pumping be increased suddenly as either may produce a water-hammer effect which may promote stoppage. The grouting of any hole shall not be considered complete until that hole refuses to take any grout whatever at three-fourths of the maximum pressure required for that stage. Should grout leaks develop, the contractor shall calk such leaks when and as directed, the cost thereof being included in the contract price for Item, "Placing Grout".

If, due to size and continuity of fracture, it is found impossible to reach the required pressure after pumping a reasonable volume of grout at the minimum workable water-cement ratio or mortar grout with the maximum volume of sand at the minimum water-cementing materials ratio the speed of the pumping shall be reduced or pumping shall be stopped temporarily and intermittent grouting shall be performed, allowing sufficient time between grout injections for the grout to stiffen. Following such reduction in pumping speed, if the desired result is not obtained, grouting in the hole shall be discontinued when directed. In such event, the hole shall be cleaned, the grout allowed to set, and additional drilling and grouting shall then be done in this hole or in the adjacent area as directed, until the desired resistance is built up.

After the grouting of any stage of a hole is finished, the pressure shall be maintained by means of a stop-cock or other suitable device until the grout has set to the extent that it will be retained in the hole. Grout that cannot be placed, for any reason, within 2 hours after mixing shall be wasted. If such grout is mixed at the direction of the Contracting Officer or with his knowledge and consent, such wasted grout except as specified in Paragraph 7-06a shall be paid for at the contract unit prices for the materials contained therein.

(3) Equipment Arrangement and Operation. - The arrangement of the grouting equipment shall be such as to provide a continuous circulation of grout throughout the system and to permit accurate pressure control by operation of a valve on the grout return line, regardless of how small the grout take may be. The equipment and lines shall be prevented from becoming fouled by the constant circulation of grout and by the periodic flushing out of the system with water. Flushing shall be done with the grout intake valve closed, the water supply valve open, and the pump running at full speed.

(4) Protection to Work and Cleanup. Except as otherwise specified, no grouting will be permitted within 100 feet of installed perforated pipe or gravel filters for foundation drains. Where permitted

in such locations, the contractor shall maintain a flow of water through the drains likely to be affected, to serve as tell-tales. In case leakage of grout into drains does occur the contractor shall immediately stop the grouting operations and shall remove all grout from the drains affected by washing to the satisfaction of the Contracting Officer, and no separate payment will be made for such work. Such stopping of grouting operations and washing of drains shall be repeated as often as required to complete the curtain grouting. During grouting operations the contractor shall take such precautions as may be necessary to prevent drill cutting, equipment exhaust oil, wash water, and grout, from defacing or damaging any permanent structure. The contractor will be required to furnish such pumps as may be necessary to care for waste water and grout from his operations. The contractor shall, upon completion of his operations, clean up all waste resulting from his operations that is unsightly or would interfere with the efficient operation of the project as anticipated by the original design.

g. Records. - The Contracting Officer will keep records of all grouting operations, such as a log of the grout holes, results of washing and pressure testing operations, time of each change of grouting operation, pressure, rate of pumping, amount of cement for each change in water-cement ratio, and other data as deemed by him to be necessary. The contractor shall furnish all necessary assistance and cooperation to this end.

h. Communications. - When, for his own convenience, the contractor has the individual elements of his plant so located that communication by normal voice between these elements is not satisfactory, the Contracting Officer may require him to install a satisfactory mechanical means of communication, such as a telephone or other suitable device.

7-06. MEASUREMENT AND PAYMENT. - a. General. - The contract prices for the various items of work and materials, as described in Paragraphs 7-06b through 7-06i, shall constitute full compensation for mobilizing, demobilizing and furnishing all equipment necessary to perform the drilling and grouting of the structure in accordance with these specifications; all drilling, washing and pressure testing of grout holes, care and disposal of waste water and waste grout, clean-up of the site, furnishing, handling, transporting and storing of grout materials, and for furnishing all labor and supplies incidental to the work. No payment will be made for grout, or the material constituents thereof, wasted due to improper anchorage of grout pipe or connections, or which is wasted due to negligence on the part of the contractor, nor for grout which is rejected by the Contracting Officer because of improper mixing. Payment will be made at the applicable contract unit prices for materials contained in grout which are wasted, where the wasting is not due to negligence on the part of the contractor.

b. Mobilization and Demobilization. - The cost of assembling all plant and equipment at the site preparatory to initiating the work and for removing it therefrom when the drilling and grouting program has

been completed, will be made at the established contract lump-sum price for Item 8a, "Mobilization and Demobilization". Sixty percent of the contract lump-sum price will be paid following completion of moving onto the site, including complete assembly in working order, of all equipment necessary to perform the required drilling and grouting operations. The remaining 40 percent of the contract lump-sum price will be paid when all equipment has been removed from the site.

c. Drilling Grout Holes. - Drilling of grout holes will be measured for payment on the basis of the linear feet of holes actually drilled in concrete or rock, as shown on the drawings or as directed. Payment for drilling grout holes will be made at the contract price per linear foot for Item 8b, "Drilling 1-1/2" (EX) Grout Holes."

d. Drilling Drain Holes. - Drilling of drain holes will be measured for payment on the basis of the linear feet of holes actually drilled in rock, as shown on the drawings or as directed. Payment for drilling drain holes will be made at the contract price per linear foot for Item 8c, "Drilling 3" (NX) Drain Holes", and shall include all costs in connection with furnishing and installing all required asbestos-cement pipe.

e. Drilling Exploratory Holes. - Drilling of exploratory holes will be measured for payment on the basis of the linear feet of holes actually drilled in concrete or rock, as directed by the Contracting Officer. Payment for drilling exploratory holes will be made at the contract price per linear foot for Item 8d, "Drilling 3" (NX) Exploratory Holes."

f. Portland Cement in Grout. - Portland cement will be measured for payment on the basis of the number of cubic feet (94 pounds) of cement used in the grout satisfactorily placed in grout holes and in exploratory holes. Payment for cement will be made at the contract price per cubic foot for Item 8e, "Portland Cement in Grout."

g. Sand in Grout. - Sand in grout will be measured for payment on the basis of the number of cubic feet of sand, dry rodded measurement, used in the grout satisfactorily placed in grout holes or in exploratory holes. Payment for sand will be made at the contract price per cubic foot for Item 8f, "Sand in Grout".

h. Placing Grout. - The operation of placing grout will be measured for payment on the basis of the number of cubic feet of materials, exclusive of water and regardless of the proportions of the mixes, measured individually, as specified in subparagraphs f and g above, satisfactorily placed. Payment for placing grout in grout holes will be made at the contract price per cubic foot for Item 8g, "Placing Grout" which price shall constitute full compensation for proportioning the mix as directed, and mixing and injecting the grout, all as specified herein or as may be directed. Separate payment will be made for all materials used in grout in accordance with the provisions of Paragraphs 7-06f and g.

i. Connections to Grout Holes. - All connections of the grout supply line to grout holes found necessary for the purpose of injecting grout, as determined by the Contracting Officer, will be paid for at the rate of five dollars and no cents ($5.00) for each connection. Payment for each such connection will be made, regardless of the amount of grout actually injected, at the established contract price per connection for Item 8h, "Connections to Grout Holes."

SECTION 8

ANCHOR BARS
(Item 20)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
8-01	General	8-1
8-02	Equipment	8-1
8-03	Drilling	8-1
8-04	Setting Anchors	8-1
8-05	Measurement and Payment	8-1

SECTION 8

ANCHOR BARS

(Item 20)

8-01. GENERAL. - This section covers furnishing and installing of anchor bars, complete.

8-02. EQUIPMENT. - All equipment shall be of a type, capacity and mechanical condition suitable for doing the work, as determined by the Contracting Officer.

8-03. DRILLING. - The contractor shall drill holes for anchor bars to such depths and in such directions as shown on the drawings or as directed. The minimum diameter of any hole shall be as indicated on the drawings.

8-04. SETTING ANCHORS. - All standing water shall be removed from the holes immediately before grouting and placing anchor bars. Each hole shall be filled with cement grout, with proper proportions or admixture similar and approved equal to "Embeco" as manufactured by the Master Builders of Cleveland, Ohio, and just enough water to produce a plastic mix, and the anchor bar shall be forced to the bottom of the hole while being vibrated by a concrete vibrating machine. Grouting of anchor bars shall be accomplished not less than six (6) days in advance of concrete operations to allow the grout to become properly set. Anchors shall be of types indicated and of sufficient length to extend the required depth into rock. Anchor bars which are found to be loose after the grout has set shall be replaced as directed by the Contracting Officer at the expense of the contractor. Anchors shall conform to the requirements of ASTM Specification A432-62T. Plates shall be of structural steel and shall be welded to bars.

8-05. MEASUREMENT AND PAYMENT. - Measurement will be made by the number of anchor bars set complete in place. Payment will be made at the contract unit price for Item 20 "Anchor Bars", which price shall include full compensation for drilling and grouting of holes, furnishing cement, water and grout, and furnishing and setting of anchor bars of size and type shown on the drawings, to the required depth below the excavated rock surface. No payment will be made for additional length of anchor bars due to rock overbreak and all costs in connection therewith shall be included under the contract unit price for "Anchor Bars."

SECTION 9

CONCRETE
(Items 21 through 25 incl.)

(Index)

Paragraph No.	Paragraph Title	Page No.
9-01	Scope of Work	9-1
9-02	Composition	9-1
	a. Concrete	9-1
	b. Concrete	9-1
9-03	Cement	9-1
	a. General	9-1
	b. Portland Cement	9-1
	c. Portland-Blast-Furnace Slag Cement	9-1
	d. Temperature of Cement	9-1
	e. Test Requirements	9-1
	f. Transportation of Bulk Cement	9-1
	g. Storage	9-2
	h. Source	9-2
9-05	Admixtures	9-2
	a. Air-entraining Admixtures	9-2
	b. Accelerator	9-2
9-06	Aggregates	9-3
	a. Composition	9-3
	b. Sources and Evaluation Testing	9-3
	c. Samples for Mix Designs	9-3
	d. Production Sampling and Testing	9-3
	e. Quality	9-4
	f. Storage	9-5
	g. Moisture Control	9-5
9-07	Water	9-5
9-08	Proportioning of Concrete	9-5
	a. General	9-5
	b. Cement Content	9-5
	c. Aggregate Content	9-6
	d. Entrained-air Content	9-6

Paragraph No.	Paragraph Title	Page No.
9-09	Batching and Mixing	9-6
	a. General	9-6
	b. Batching Plant	9-6
	c. Concrete Mixers	9-7
9-10	Conveying	9-9
9-11	Placing	9-10
	a. General	9-10
	b. Time Interval Between Mixing and Placing	9-10
	c. Placing Temperature	9-11
	d. Concrete on Earth Foundations	9-11
	e. Concrete on Rock Foundations	9-11
	f. Lift in Concrete	9-11
	g. Vibration of Concrete	9-11
	h. Placing Concrete through Reinforcement	9-12
	i. Placing Concrete in Ogee Crest and Spillway Buckets	9-12
9-12	Construction Joint Treatment	9-12
	a. General	9-12
	b. Cleaning	9-12
9-13	Expansion, Contraction and Vertical Construction Joints	9-13
	a. General	9-13
	b. Joint Fillers	9-13
9-14	Finishing	9-13
	a. General	9-13
	b. Unformed Surfaces	9-13
	c. Surface Irregularities	9-14
	d. Sack-rubbed Finish	9-14
	e. Nonslip Finish	9-14
9-15	Curing and Protection	9-15
	a. General	9-15
	b. Moist Curing	9-15
	c. Cold Weather	9-15

Paragraph No.	Paragraph Title	Page No.
9-16	Forms and Formed Surfaces	9-16
	a. General	9-16
	b. Surface Finish Requirements	9-16
	c. Construction Tolerances	9-17
	d. Coating	9-20
	e. Removal	9-20
9-17	Furnishing and Placing Steel Reinforcement	9-20
	a. General	9-20
	b. Cutting and Bending	9-20
	c. Reinforcement	9-21
	d. Spacing of Bars	9-21
	e. Relation of Bars to Concrete Surfaces	9-21
	f. Splicing	9-21
	g. Supports	9-21
9-18	Embedded Items	9-21
9-19	Measurement and Payment	9-22
	a. Concrete	9-22
	b. Portland Cement	9-23
	c. Reinforcement	9-23
	d. Other Items	9-23

SECTION 9

CONCRETE
(Items 21 through 25, incl.)

9-01. SCOPE OF WORK. - The work covered by this section consists of furnishing all material and equipment and performing all labor for the manufacture, forming, transporting, placing, finishing, and curing of concrete in the structures included in these specifications.

9-02. COMPOSITION. - a. Concrete. - Concrete shall be composed of portland cement, water, fine and coarse aggregate, and an air-entraining admixture, or

b. Concrete. - Concrete shall be composed of portland blast furnace slag cement, water, fine and coarse aggregate and an air-entraining admixture.

9-03. CEMENT. - a. General. - Cement shall be furnished in bulk except that cement necessary for finishing and patching may be packaged.

b. Portland Cement. - Portland cement shall conform to Federal Specification SS-C-00192f (COM-NBS) Type I or II.

c. Portland-Blast-Furnace Slag Cement. - Portland-blast-furnace slag cement shall conform to Federal Specification SS-C-00197d (COM-NBS), Type IS.

d. Temperature of Cement. - The temperature of the cement as delivered to storage at the site, shall not exceed 150 degrees F.

e. Test Requirements. - Cement will be sampled at the mill or shipping point. All tests will be made by, or under the supervision of, the Government and at its expense. No cement shall be used until notice has been given by the Contracting Officer that the test results are satisfactory. In the event of failure, the cement may be resampled and tested at the contractor's expense. If tests prove that a cement which has been delivered is unsatisfactory, it shall be promptly removed from the site of work. Cement which has been in storage at the project site over four months shall not be used until retest proves it to be satisfactory. When cement is sampled at the mill or shipping point the fill gate or gates of the bin will be sealed and kept sealed until shipment from the bin has been completed. Sealing of the fill gate or gates will be done by or under the supervision of the Government.

f. Transportation of Bulk Cement. - When bulk cement is not unloaded from primary carriers directly into weathertight hoppers at the batching plant, transportation from the railhead, mill, or intermediate

storage to the batching plant shall be accomplished in adequately designed weathertight trucks, conveyors, or other means which will protect the cement completely from exposure to moisture.

g. Storage. - Immediately upon receipt at the site of the work, cement shall be stored in a dry, weathertight and properly ventilated structure. All storage facilities shall be subject to approval and shall be such as to permit easy access for inspection and identification. Sufficient cement shall be in storage to complete any lift of concrete started. In order that cement may not become unduly aged after delivery, the contractor shall use any cement which has been stored at the site for 60 days or more before using cement of lesser age.

h. Source. - The contractor shall notify the Contracting Officer of the source or sources from which the cement will be obtained at least 60 days in advance of the time when concrete placing is expected to begin. If cement is to be obtained from more than one mill, the notification shall state the estimated amount of cement to be obtained from each mill and the proposed schedule of shipments.

9-05. ADMIXTURES. - a. Air-entraining Admixtures. - (1) General. - The air-entraining admixture shall be any approved substance or compound which will produce only entrained air in the concrete as hereinafter specified. The air-entraining admixture shall be added to the batch in solution in a portion of the mixing water. This solution shall be batched by means of a mechanical batcher capable of accurate measurement and in such a manner as will insure uniform distribution of the admixture throughout the batch during the specified mixing period.

(2) Tests. - The contractor shall notify the Contracting Officer in writing of the source from which the admixture will be obtained at least 45 days in advance of the time when concrete placing is expected to begin. The contractor shall provide satisfactory facilities for the ready procurement of adequate test samples. All tests for the evaluation and approval of an admixture will be made by and at the expense of the Government. The suitability of an air-entraining admixture for use will be based on tests prescribed in, and shall meet the requirements of, Corps of Engineers Serial No. CRD-C 13-55 & Revs. 1957-1958. An air-entraining admixture which has been in storage at the project site for longer than 6 months or which has been subjected to freezing shall not be used until retest proves it to be satisfactory.

b. Accelerator. - When approved or directed, the contractor shall use 1 percent of calcium chloride, by weight, of the cement in concrete being placed when the weather is cold enough to require protection of the concrete from freezing. Calcium chloride shall meet the requirements of Federal Specification O-C-105a & Am-1, Type I or Type II. It shall be measured accurately and shall be added to the batch in solution in a portion of the mixing water. The use of calcium chloride in concrete

shall in no way relieve the contractor of responsibility for compliance with the requirements of these specifications governing protection and curing of the concrete.

9-06. AGGREGATES. - a. Composition. - Fine aggregate shall consist of natural sand, manufactured sand, or a combination of natural and manufactured sands. Coarse aggregate shall consist of gravel, crushed gravel, crushed stone, or a combination thereof.

b. Sources and Evaluation Testing. - Aggregates shall be produced from the approved sources listed in Paragraph SC-56 or from another source when approved in accordance with Paragraph SC-56 and the Technical Provisions herein. If the contractor proposes to furnish aggregates from a source not previously approved, the Government will make such tests and other investigations as necessary to determine whether or not aggregates meeting the requirements of these specifications can be produced from the proposed sources. The tests to which the aggregate will be subjected will include specific gravity, absorption, Los Angeles abrasion, soundness in magnesium sulfate, petrographic analyses, freezing and thawing in concrete, alkali-aggregate reaction, organic impurities, and any other tests that are necessary to demonstrate that concrete of acceptable quality can be produced from the materials proposed. These tests will be conducted in accordance with the applicable Corps of Engineers methods of test given in the Handbook for Concrete and Cement. When the contractor desires to use aggregates from a source not previously approved, suitable samples for quality evaluation shall be taken under the supervision of the Contracting Officer in accordance with Corps of Engineers Serial No. CRD-C 100-55 and Revs. of 1958, 1960 and 1963 and shall be delivered in 80-pound lots packed in clean canvas bags to 424 Trapelo Road, Waltham, Massachusetts 02154, within 15 days after date of notice to proceed. Approximately 1,500 pounds of each size shall be required. Sampling and shipping of samples shall be at the contractor's expense.

c. Samples for Mix Designs. - Samples of the aggregates, representative of the materials approved for use in the work, shall be taken under the supervision of the Contracting Officer in accordance with the Corps of Engineers Serial No. CRD-C 100-55 and Revs. of 1958, 1960 and 1963 and delivered in 80 pound lots in clean canvas bags securely tied and identified to 424 Trapelo Road, Waltham, Mass., by the contractor at his expense at least 90 days in advance of the time when the placing of concrete is expected to begin. Mix design studies and tests will be made by the Government and at its expense. Approximately 3,500 pounds of each size aggregate, 15 bags of cement and 1 quart of air-entraining agent shall be required for each mix design. The cement or cements and air-entraining agent shall be those selected for the project.

d. Production Sampling and Testing. - During construction, aggregates will be sampled as delivered to the mixer to determine compliance with specification provision. The contractor shall provide

facilities and labor as may be necessary for the ready procurement of representative test samples. Samples will be obtained when directed by the Contracting Officer and under his supervision. The Government will test such samples at its expense using appropriate Corps of Engineers and ASTM test methods. Tests of aggregates at various stages in the processing and handling operations will be made at the discretion of the Contracting Officer.

e. Quality. - Aggregates, as delivered to the mixer, shall consist of clean, hard, and uncoated particles. Where required, fines shall be removed from the coarse aggregates by adequate washing. The aggregates shall conform to the following specific requirements:

(1) Grading. - (a) Fine Aggregate. - The grading and uniformity of the fine aggregate shall conform to the following requirements as delivered to the mixers:

Sieve Designation, U.S. Standard Square Mesh	Percentage by Weight Passing
No. 4	95-100
No. 8	80-90
No. 16	55-75
No. 30	30-60
No. 50	12-30
No. 100	2-10

In addition to the grading limits shown above, the fine aggregate, as delivered to the mixer, shall have a fineness modulus of not less than 2.40 nor more than 3.10. The grading of the fine aggregate shall also be controlled so that the fineness moduli of at least four of any five consecutive test samples of the fine aggregate as delivered to the mixer shall not vary more than 0.15 from the average fineness modulus of all samples taken during the first month's operation unless otherwise directed. The fineness modulus shall be determined by dividing by 100, the sum of the cumulative percentages retained on U.S. Standard Sieves Nos. 4, 8, 16, 30, 50 and 100. At the option of the contractor, fine aggregate may be separated into two or more sizes or classifications, but the uniformity of grading of the separate sizes shall be controlled so that they may be combined throughout the job in fixed proportions established during the first month of operation.

(b) Coarse Aggregate. - The grading of the coarse aggregate within the separated size groups shall conform to the following requirements. These size groups may be obtained by blending additional individual sizes to comply with the required gradations.

Sieve Size U. S. Standard Square Mesh	Percent by Weight Passing Individual Sieves	
	No. 4 to 3/4 In.	3/4 In. to 1-1/2 In.
2 in.		100
1-1/2 in.		90-100
1 in.	100	20-45
3/4 in.	90-100	0-10
1/2 in.	55-75	-
3/8 in.	30-55	0-5
No. 4	0-5	-

(2) Particle Shape. - The shape of the particles in the fine aggregate and in the coarse aggregate shall be generally spherical or cubical. The quantity of flat and elongated particles in the separated size groups of coarse aggregate, as defined and determined by Corps of Engineers Serial No. CRD-C 119-53, shall not exceed 25 percent in any size group.

f. Storage. - Aggregates shall be stored adjacent to the batch plant in such manner as to prevent the inclusion of foreign materials in the concrete. Sufficient aggregate shall be maintained at the site at all times to permit continuous placement and completion of any lift of concrete started.

g. Moisture Control. - All fine aggregate and the smallest size group of the coarse aggregate shall remain in free-draining storage at the site until a stable moisture content is obtained prior to use.

9-07. WATER. - Water for washing aggregates and for mixing and curing concrete shall be fresh and free from injurious amounts of oil, acid, salt, alkali, organic matter, or other deleterious substances as determined by Corps of Engineers Serial No. CRD-C 400-63.

9-08. PROPORTIONING OF CONCRETE. - a. General. - The proportions of all material entering into the concrete shall be as directed. The proportions will be changed whenever such change is determined necessary to maintain the standard of quality required for the structures covered by these specifications and to meet the varying conditions encountered during construction.

b. Cement Content. - The cement content of the concrete for the various parts of the structure will range from an approximate minimum of 5 to an approximate maximum of 7 bags per cubic yard, depending on the size, type and gradation of aggregate used, and on the structural requirements.

c. Aggregate Content. - The amount and maximum size of aggregate to be used in the various parts of the structure shall be as directed. Concrete mixes will be designed using 1-1/2 inch and 3/4-inch maximum sizes and using the maximum amount of coarse aggregate available and placeable in the various parts of the structures.

d. Entrained-air Content. - The total calculated air content shall be between 5 and 7 percent of the volume of the concrete based on measurements made on concrete immediately after discharge from the mixer (CRD-C 41-59 and Rev. 63). The quantity of air within this range shall be as directed and shall be changed whenever such change is determined necessary to meet the varying conditions encountered during construction.

9-09. BATCHING AND MIXING. - a. General. - The contractor shall provide a batching plant and concrete mixing equipment having a capacity of at least 150 cubic yards in eight hours.

b. Batching Plant. - (1) Location. - The batching plant may be located "on-site" or "off-site".

(2) Arrangement. - Separate bins or compartments shall be provided for fine aggregate, for the different sizes of coarse aggregate and for bulk cements when used. The compartments shall be of ample size and so constructed that the materials will be maintained separated under all working conditions. Aggregates may be weighed cumulatively in one weigh batcher on one scale. Bulk cement shall be weighed either on a separate scale or cumulatively with the aggregate in a separate compartment attached to the aggregate weighing hopper. If cement is weighed on the same scale as the aggregates, the cement shall be weighed first and all hoppers shall be empty and the scale shall be in balance before the weighing is begun. Water may be measured by weight or by volume. If measured by weight it shall not be weighed cumulatively with any other ingredient. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for readily obtaining representative samples of aggregate from each of the bins or compartments for test purposes. Delivery of materials from the batching equipment shall be within the following limits of accuracy:

Material	Percent
Cement	2
Water	2
Aggregate	3
Admixtures	3

When materials are weighed cumulatively, each limit above applies to the total weight in the batcher after the material corresponding to that limit has been batched.

(3) Water Batcher and Dispenser for Admixture. - Equipment for batching water and the air-entraining admixture shall be provided at the batching plant or included with the paving mixers or truck mixers as required for the type of plant used.

(a) Water Batchers. - A suitable water measuring device shall be provided which will be capable of measuring the mixing water within the specified requirements for each batch. The mechanism for delivering water to the mixers shall be such that leakage will not occur when the valves are closed. The filling and discharge valves for the water batcher shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed.

(b) Dispenser. - A suitable device for measuring and dispensing the air-entraining admixture shall be provided. The device shall be capable of ready adjustment to permit varying the quantity of admixture to be batched. The dispenser of air-entraining admixtures shall be interlocked with the batching and discharging operations of the water so that the batching and discharging of the admixture will be automatic. When use of truck mixers makes this requirement impracticable, the air-entraining admixture dispenser shall be interlocked with the sand batcher.

(4) Scales. - Adequate facilities shall be provided for the accurate measurement and control of each of the materials entering each batch of concrete. The accuracy of the weighing equipment shall conform to the applicable requirements of National Bureau of Standards Handbook 44 for such equipment. The contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring device. Periodic tests shall be made in the presence of a Government inspector in such a manner and at such intervals as may be directed. Upon completion of each check test and before further use, the contractor shall make such adjustments, repairs or replacements as may be required to secure satisfactory performance. Each weighing unit shall include a visible springless dial, which shall indicate the scale load at all stages of the weighing operation, or shall include a beam scale with a beam balance indicator which will show the scale in balance at zero load and at any beam setting. The indicator shall have an over and under travel equal to at least 5 percent of the capacity of the beam. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

c. Concrete Mixers. - Mixers may be stationary drum or turbine mixers, truck mixers, or paving mixers of approved design. The mixers shall have a rated capacity of at least 27 cubic feet of mixed concrete, and shall not be charged in excess of the capacity recommended by the manufacturer. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. Each stationary and paving mixer shall be provided with an acceptable device to

lock the discharge mechanism until the required mixing time has elapsed. Truck mixers shall be equipped with accurate revolution counters and water meters (Neptune Type "S" or equivalent). The mixers shall be operated at the drum or blade speed designated by the manufacturer on the name plate. The mixing periods specified herein are predicated on proper control of the speed of rotation of the mixer drum or mixing blades and on proper introduction of the materials into the mixer. The mixing time will be increased when such increase is necessary to secure the required uniformity of the concrete, or when tests of samples of concrete taken from the first, middle and last portions of the mixer discharge exceed any of the following uniformity requirements when tested in accordance with the provisions of CRD-C 55-61. When authorized, the mixing time may be reduced to the minimum time required to meet all the following requirements:

Test	Maximum Allowable Variation of Any One Test Value from the Average of Three
Water content of mortar, by weight	5.0%
Coarse aggregate content of concrete by weight	5.0%
Unit weight of air-free mortar	0.8%
Cement content of dried mortar, by weight	10.0%

Excessive overmixing requiring additions of water, will not be permitted. The mixers shall be maintained in satisfactory operating condition, and mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than 10 percent of their depth. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired. Suitable facilities shall be provided for obtaining representative samples of concrete for uniformity tests. All necessary platforms, tools, and equipment for obtaining samples shall be furnished by the contractor.

(1) Stationary Mixers. - If no uniformity test data are available, the mixing time for each batch after all solid materials are in the mixer, provided that all of the mixing water is introduced before one-fourth of the mixing time has elapsed, shall be one minute for mixers having a capacity of one cubic yard; for mixers of larger capacities, the minimum mixing time shall be increased 15 seconds for each additional one-half cubic yard or fraction thereof of concrete mixed. When a stationary mixer is used for partial mixing of the concrete (shrink mixing) the mixing time in the stationary mixer may be reduced to the minimum necessary to intermingle the ingredients (about 30 seconds).

(2) Truck Mixers. - Truck mixers shall conform to the requirements of Federal Specification SS-C-618a. When a truck mixer is used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer, in the absence of uniformity test data, each batch of concrete shall be mixed not less than 70 nor more than 100 revolutions of the drum at the rate of rotation designated by the manufacturer of the equipment as mixing speed and at the capacity designated in Federal Specification SS-C-618a. If the batch is at least 1/2 cubic yard less than the rated capacity, in the absence of uniformity test data, the number of revolutions at mixing speed may be reduced to not less than 50. Any additional mixing shall be done at the speed designated by the manufacturer of the equipment as agitating speed. When necessary for proper control of the concrete, mixing transit mixed concrete will not be permitted until the truck mixer is at the site of the concrete placement.

(3) Paving Mixers. - Paving mixers shall be used at the site of concrete placement, except as otherwise approved in writing by the Contracting Officer. Paving mixers shall be equipped with boom and bottom-dump bucket to handle the concrete from the mixer to the form. The bucket will be of adequate size to handle the complete batch of concrete mixed, and the boom shall be of sufficient length to permit discharge of the concrete into its final position in the boom. The boom may be replaced with an acceptable crane. Paving mixers may be of either single compartment drum or multiple compartment drum type. A sled or box of suitable size shall be attached to the mixer under the bucket so as to catch any spillage of concrete that may occur when the mixer is discharging concrete into the bucket. Multiple compartment drum paving mixers shall be properly synchronized, and the mixing time shall be determined by including the time required to transfer the concrete between compartments of the drum. If no uniformity test data are available, the mixing time for each batch, after all solid materials are in the mixer drum, provided that all the mixing water is introduced before one-fourth of the mixing time has elapsed, shall be one minute for mixers having a capacity of one cubic yard; for mixers of larger capacities, the minimum mixing time shall be increased 15 seconds for each additional 1/2 cubic yard or fraction thereof of concrete mixed. Vehicles used in transporting material from the batching plant to the mixers shall have bodies or compartments of adequate capacity to carry the materials and to deliver each batch, separate and intact, to the mixer. Except as otherwise approved by the Contracting Officer, loose cement shall be transported from the batching plant to the mixers in separate boxes or compartments which shall be equipped with windproof and rainproof covers.

9-10. CONVEYING. - Concrete shall be conveyed from mixer to forms as rapidly as practicable, by methods which will prevent segregation or loss of ingredients. Any wet batch hopper through which the concrete passes shall be conical in shape. There shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Belt conveyors, chutes, or other similar equipment will not be permitted for conveying concrete. Truck mixers or agitators used for transporting central-mixed concrete shall conform to the

applicable requirements of Federal Specification SS-C-618a. Non-agitating equipment for transporting central-mixed concrete may be used when authorized in writing by the Contracting Officer. Methods and equipment for handling and depositing the concrete in the form shall be subject to the approval of the Contracting Officer. Telephonic or other satisfactory means of rapid communication between the mixing plant and the forms in which concrete is being placed shall be provided and made available for use by the inspectors in the mixing plant and forms.

9-11. PLACING. - a. General. - Concrete shall be worked into the corners and angles of the forms and around all reinforcement and embedded items without permitting the material to segregate. Concrete shall be deposited as close as possible to its final position in the forms. Placing the concrete shall, as far as practicable, be done by means of bottom-dump buckets. The design of the buckets shall be such that the ratio of the area of the clear gate opening or gate throat opening is not less than one-third the maximum interior horizontal area. The design of the bucket shall also provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position. The depositing of concrete by any method used shall be regulated so that the concrete may be effectively compacted with a minimum of lateral movement into horizontal layers approximately 1-1/2 feet in thickness. Not more than four cubic yards may be deposited in one pile for compaction. The surfaces of construction joints shall be kept continuously wet for at least twelve hours during the twenty-four hour period prior to placing concrete. Free water shall be removed prior to placement of mortar and additional concrete. All approximately horizontal surfaces shall be covered by a layer of mortar of the composition directed. Concrete shall then be placed immediately upon the fresh mortar. All concrete placing equipment and methods shall be subject to approval. Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation.

b. Time Interval Between Mixing and Placing. - Concrete mixed in stationary mixers and transported by non-agitating equipment shall be placed within thirty minutes after it has been mixed, unless otherwise authorized. When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregates except that when the temperature of the concrete exceeds 85 degrees F. the time shall be reduced to 45 minutes. The concrete shall be placed within 15 minutes after it has been discharged.

c. Placing Temperature. - Concrete, when deposited in the forms during cold weather, shall have a temperature of not less than 50 degrees F. nor more than 70 degrees F. Heating of the mixing water or aggregates will not be permitted until the temperature of the concrete has decreased to 50 degrees F. The materials shall be free from ice, snow, and frozen lumps before entering the mixer. All methods and equipment shall be subject to approval. When heating is necessary to keep the concrete temperature above 50 degrees F., it shall be regulated so that the concrete temperature does not exceed 70 degrees F. All concrete placed during warm weather shall be delivered to the forms at the coolest temperature which is practicable to produce under current conditions but not above 85 degrees F.

d. Concrete on Earth Foundations. - Earth foundations upon which concrete is to be placed shall be clean, damp, and free from frost, ice, and standing or running water. Prior to placing concrete the earth foundation shall have been satisfactorily compacted in accordance with the provisions of the excavation sections.

e. Concrete on Rock Foundations. - Rock surfaces upon which concrete is to be placed shall be clean, free from oil, standing or running water, ice, mud, drummy rock, coating, debris and loose, semidetached or unsound fragments. Faults or seams shall be cleaned to a satisfactory depth and to firm rock on the sides. Immediately before concrete is placed, all rock surfaces shall be cleaned thoroughly by the use of wet sandblasting. All devices necessary to produce a foundation free of running or standing water shall be installed by the contractor and securely fastened in place so as to prevent their being jarred loose by concrete placement. The devices and methods of installation shall be approved. All rock surfaces shall be kept continuously wet for at least 24 hours immediately prior to placing concrete thereon. All approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar of the composition directed.

f. Lift in Concrete. - The depth of concrete placed in each lift will be as shown on the drawings or specified herein. All concrete shall be deposited in approximately horizontal layers about 1-1/2 feet in thickness unless otherwise specifically authorized or directed. The placement shall be carried on at such a rate that the formation of cold joints will be prevented. Slabs shall be placed in one lift unless otherwise authorized or directed. In walls, lifts including door and window openings shall terminate at the top and bottom of the openings unless architectural details indicate otherwise, and other lifts shall terminate at such levels as will conform to architectural details.

g. Vibration of Concrete. - Concrete shall be compacted with mechanical vibrating equipment supplemented by handspading and tamping. In no case shall vibrators be used to transport concrete inside the forms. The vibrating equipment shall be of the internal type and shall at all

times be adequate in number of units and power of each unit to properly consolidate all concrete. Form or surface vibrators shall not be used unless specifically approved. Internal vibrators shall maintain a frequency when submerged in the concrete of not less than 6,000 impulses per minute for spuds with diameters greater than 5-inches and 7,000 impulses for smaller spuds. The intensity (amplitude) of vibration shall be sufficient to produce satisfactory consolidation. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation. The manipulation of the concrete adjacent to the surface of a lift in connection with completing lift placement shall be the minimum necessary to produce the required consolidation. Excessive surface working will not be permitted. Coarse gravel protruding from the surface of the lift shall be "walked down" into the mass during the initial vibrating operations.

h. Placing Concrete through Reinforcement. - In placing concrete through reinforcement, care shall be taken that no segregation of the coarse aggregate occurs. On the bottom of beams and slabs, where the congestion of steel near the forms makes placing difficult, a layer of mortar of the composition directed shall be first deposited to cover the surface to a depth of approximately one inch.

i. Placing Concrete in Ogee Crest and Spillway Buckets. - The unformed portion of the ogee crest and spillway bucket which is to be finished shall be carried slightly above grade and struck off to grade by accurately screeding. Screeding may be accomplished by semimechanical devices or by a mechanical screed which consolidates and screeds the surface in one operation. Ribs embedded in the fresh concrete as guides for screeds will not be permitted.

9-12. CONSTRUCTION JOINT TREATMENT. - a. General. - As a lift is completed, the top surface shall be immediately and carefully protected from any condition that will damage the concrete.

b. Cleaning. - Horizontal construction joints on lifts shall be prepared for receiving the next lift by cleaning with wet sandblasting. Approved wet sandblasting equipment shall be provided.

(1) Wet Sandblasting. - Wet sandblasting shall be performed immediately before placing the following lift. The operation shall be continued until all unsatisfactory concrete, and all laitance, coating, stains, debris, and other foreign materials are removed. The surface of the concrete shall then be washed thoroughly to remove all loose material.

(2) Waste Disposal. - The method used in disposing of waste water employed in cutting, washing and rinsing of concrete surfaces shall be such that the waste water does not stain, discolor, or affect exposed surfaces of the structures. Methods of disposal shall be subject to approval.

9-13. EXPANSION, CONTRACTION AND VERTICAL CONSTRUCTION JOINTS. - a. General. - Joints shall be provided at the locations indicated on the drawings and according to the details shown on Drawing Std. No. 3 inserted at the end of this section, as shown on the contract drawings or as otherwise approved. The methods and materials used shall be subject to approval and the materials shall conform to Federal Specifications wherever applicable. In no case shall any fixed metal, embedded in concrete, be continuous through an expansion or contraction joint.

b. Joint Fillers. - Premoulded expansion joint filler shall conform to Federal Specification HH-F-341a. Fibrous mastic for bituminous mastic joints shall conform to Federal Specification SS-C-153, type I, heavily fibered with asbestos fibers, shall be suitable for use without priming concrete, and shall, unless otherwise shown, be troweled to a minimum thickness of 1/8-inch applied in two equal applications which shall be continuous over the entire surface.

9-14. FINISHING. - a. General. - Immediately after removal of forms, all unsightly ridges or lips shall be removed and undesirable local bulging on the surfaces to be permanently exposed shall be remedied. Excessive rubbing of formed surfaces will not be permitted. Voids and holes left by the removal of tie rods in all permanently exposed surfaces and surfaces to be exposed to water shall be reamed and completely filled with dry-patching mortar (preshrunk) mixed in the proportions directed. The cement used in the mortar shall be a blend of portland cement and white portland cement properly proportioned so that the final color of the cured mortar will be the same as the color of the surrounding concrete. Defective concrete shall be repaired by cutting out the unsatisfactory material and placing new concrete which shall be secured with keys, dovetails or anchors. Concrete for patching shall be drier than the usual mixture and shall be thoroughly tamped into place. All unformed surfaces of concrete shall have a wood float finish, unless a steel trowel finish is specified, without additional mortar and shall be true to elevation as shown on the drawings. Care shall be taken to see that all free water which has accumulated at the surface is removed before making any finish. Other surfaces shall be brought to the specified elevation and left true and regular. Where indicated on the drawings, joints shall be carefully made with a jointing tool. Every precaution shall be taken by the contractor to protect finished surfaces from stains or abrasions. Surfaces or edges likely to be injured during the construction period shall be properly protected.

b. Unformed Surfaces. - The Bubble Gage Shelter floor and the transition section floor shall be given a steel trowel finish. Where wood float finish is indicated or specified, floating shall be started as soon as the screeded surface has stiffened sufficiently to permit floating and shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Floating may be performed by use of hand or power-driven equipment. Where a steel-trowel is specified or indicated, troweling shall be performed as soon as the floated surface has hardened sufficiently

to prevent an excess of fine material from being drawn to the surface. Steel troweling shall be performed with firm pressure to produce a dense, uniform surface, free from blemishes and trowel marks. Surfaces shall be sloped for drainage where shown on the drawings or directed. Dusting of fresh concrete with dry cement prior to finishing will not be permitted.

c. Surface Irregularities. - Surface irregularities of either a floated or wood troweled finish shall not exceed 1/4-inch as measured with a 10-foot template and of steel trowel finish shall not exceed 1/8-inch as measured with a 10-foot template.

d. Sack-rubbed Finish. - This type of finish shall be given to exterior exposed-to-view surfaces of Bubble Gage Shelter and adjacent stairs vertical surfaces. As approved by the Contracting Officer and after all required patching, cleaning, and correction of major imperfections have been completed, the concrete surface shall be given a sack-rubbed finish as hereinafter described. The finish for any area shall be completed in the same day and the limits of a finished area shall be made at natural breaks in the finished surface. The sack-rubbed finish shall consist of thoroughly wetting the surface to prevent absorption of water from the mortar and then coating the surface with mortar. The mortar shall be applied as soon as the surface of the concrete approaches surface dryness and shall be vigorously and thoroughly rubbed over the area with clean burlap pads so as to fill all voids. The mortar shall be composed of one part Portland cement to two parts by volume of well-graded sand passing a No. 30 sieve mixed with water to the consistency of thick paint. White cement shall be used for all or part of the cement as approved by the Contracting Officer to give the desired color. The applied coating shall be uniform, completely filling all pits, air bubbles, and surface voids. While the mortar is still plastic, the surface shall be sack-rubbed with a dry mix of the same proportions and materials specified above, except that no water will be used. The burlap pads used for this operation shall be stretched tightly around a board to prevent dishing the mortar in the voids. No material shall remain on the surface except that within the voids. The sack-rubbing with a dry mix shall be performed at a time when the mortar will not be pulled from the voids or depressions. In hot, dry weather the sack-rubbed finish treatment shall be made in shaded areas. If it is absolutely necessary to perform sack-rubbed finishing in areas subject to direct rays of the sun, the concrete surfaces shall be covered with damp burlap, or a continuous fog spray applied, or some other suitable method used to moisten the concrete surface for a minimum of one hour before finishing operations are begun. Immediately after the sack-rubbed treatment is completed, the surface shall be continuously moist cured for 72 hours.

e. Nonslip Finish. - Nonslip finish shall be given to exterior stair treads and roof of the Bubble Gage Structure. The concrete shall be finished by tamping with special tools to force the coarse aggregate away from the surface, then screeding and floating to bring the surface to the required level. The concrete while still plastic, shall be wood floated and brushed in a direction transverse to the traffic with a camel hair broom to produce a surface having a rough texture providing an approved nonslip finish.

9-15. CURING AND PROTECTION. - a. General. - All concrete shall be cured by an approved method or combination of methods for the period of time given below corresponding to the cementing materials used in the concrete:

Type I portland cement	7 days
Type II portland cement or portland-blast-furnace-slag cement	14 days

The contractor shall have all equipment needed for adequate curing and protection of the concrete on hand and ready to install before actual concrete placement begins. The curing medium and method, or the combination of mediums and methods used, shall be approved in writing. The curing medium shall be applied so as to prevent loss of moisture from the concrete. Concrete shall be protected from heavy rains for 12 hours, flowing water for 14 days and direct rays of the sun for 3 days. All concrete shall be adequately protected from damage. No fire or excessive heat shall be permitted near or in direct contact with concrete at any time. All conduits and other formed openings through the concrete shall be closed during the entire construction period.

b. Moist Curing. - All concrete herein shall be moist-cured by maintaining all surfaces continuously (not periodically) wet for the duration of the entire curing period with the exceptions listed below. Water for curing shall comply with the requirements of paragraph 9-07. All surfaces of concrete, which are to be permanently exposed, shall be cleaned if a water is used which stains the surfaces: Where forms of tongue-and-groove or shiplap sheathing are used and left in place during curing, the sheathing shall be kept wet at all times. Horizontal construction joints and finished horizontal surfaces cured with sand shall be covered with a uniform thickness of 2 inches of sand which shall be kept continuously saturated. The following exceptions to the requirements for moist curing are permitted:

(1) Horizontal construction joints may be allowed to dry for twelve hours immediately prior to the placing of the following lift;

(2) Concrete for which cold weather protection is provided entirely by insulation may be cured by the following procedure:

All joints in the insulation may be sealed to prevent moisture loss and maintained sealed throughout the curing period.

c. Cold Weather. - The air and forms in contact with concrete sections having a minimum dimension less than 12 inches shall be maintained at temperature above 50 degrees F. for at least the first 3 days and at a temperature above freezing for the remainder of the specified curing period. Concrete in more massive sections shall be maintained at temperatures above 40 degrees F. for at least the first 3 days and at a temperature above freezing for the remainder of the specified curing period. The temperature

protection equipment, the curing water and the removal of forms shall be handled in such a manner that the surface concrete will not be subjected to a temperature differential of more than 25 degrees F. as determined by observation of ambient and concrete surface temperatures indicated by suitable thermometers, furnished by the contractor and installed outside of the concrete and 2 inches inside the surface of the concrete. The installation of the thermometers shall be made by the contractor at such locations as may be directed.

9-16. FORMS AND FORMED SURFACES. - a. General. - Forms shall be true to line and grade, mortar-tight and sufficiently rigid to prevent objectionable deformation under load. That portion of the form in contact with the concrete shall not be of a material which interferes with the setting of the concrete. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar. Responsibility for their adequacy shall rest with the contractor; however, the type, shape, size, quality, and strength of all materials of which the forms are made shall be subject to specific approval. Bolts and rods used for internal ties shall be so arranged, that when the forms are removed, metal will be not less than 2 inches from any concrete surface. Wire ties will not be permitted where the concrete surface will be exposed to weathering and where discoloration will be objectionable. All forms shall be so constructed that they can be removed without damaging the concrete. All exposed joints, edges, and external corners shall be chamfered and dummy chamfers and false joints shall be used to provide a neat and uniform appearance, unless otherwise directed or indicated on the drawings.

b. Surface Finish Requirements. - The class of finish required for the various surfaces of the structures shall be as hereinafter specified or directed on drawings. Allowable irregularities are designated "abrupt" and "gradual" for purposes of providing tolerances. Offsets resulting from displaced, misplaced or mismatched forms, or sheathing, or by loose knots in sheathing, or other similar form defects, shall be considered "abrupt" irregularities. Irregularities resulting from warping, unplaneness and similar uniform variations from planeness, or true curvature, shall be considered "gradual" irregularities. "Gradual" irregularities will be checked for conformance with the prescribed tolerances by means of 5-foot templates composed of a straight edge for plane surfaces, or a "shaped" template for curved or warped surfaces. The requirements for the classes of finish specified on the drawings and for the types of form materials permitted for each class shall be as specified below:

(1) Class "A" Finish. - Class "A" finish shall be given to exterior of Bubble Gage Shelter and adjacent stair vertical surfaces and to stop log slots. Where Class "A" finish is specified, the sheathing shall be composed of well-matched tight-fitting tongue and groove lumber or plywood or concrete form board. If necessary, the sheathing shall be sanded to remove imperfections and to provide a form surface which will produce a concrete surface meeting the following tolerances: "Abrupt" irregularities shall not exceed 1/8-inch. "Gradual" irregularities shall not exceed 1/4-inch in 5 feet, determined in the specific manner.

(2) Class "B" Finish. - Class "B" finish shall be given to all concrete surfaces except where Class "A" or Class "D" is specified. Where Class "B" finish is specified, the sheathing may be composed of tongue and groove lumber, shiplap, plywood, concrete form board, or steel. Steel lining on wood sheathing will not be permitted. The sheathing shall provide a surface which will produce a concrete surface meeting the following tolerances: "Abrupt" irregularities shall not exceed 1/4-inch and "gradual" irregularities shall not exceed 1/2-inch in 5 feet determined in the specified manner.

(3) Class "D" Finish. - Class "D" finish shall be given to all surfaces against which backfill or concrete is to be placed. Where Class "D" finish is specified, the sheathing may be of wood, or steel, or may be steel lined. "Gradual" and/or "abrupt" irregularities shall not exceed 1 inch.

c. Construction Tolerances. - Variation in alignment, grade and dimensions of the structures from the established alignment, grade and dimensions shown on the drawings shall be within the tolerances specified in the following tables:

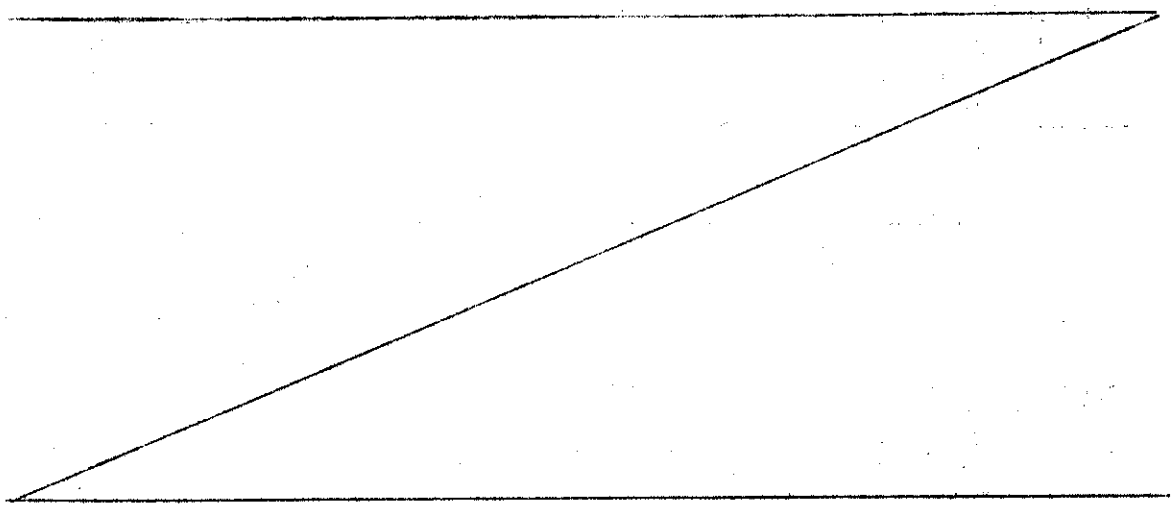


TABLE I

CONSTRUCTION TOLERANCES FOR REINFORCED CONCRETE CONSTRUCTION

(1)	Variation from the plumb:	
	a. In the lines and surfaces of columns, piers, walls and in arrises	In 10 feet . . . . . 1/4 inch In any story or 20 feet maximum. . 3/8 inch In 40 feet or more . 3/4 inch
	b. For exposed corner columns, control-joint grooves, and other conspicuous lines	In any bay or 20 feet maximum . 1/4 inch In 40 feet or more . 1/2 inch
(2)	Variation from the level or from the grades indicated on the drawings:	
	a. In floors, ceilings, beam soffits, and in arrises	In 10 feet . . . . . 1/4 inch In any bay or 20 feet maximum . . 3/8 inch In 40 feet or more . 3/4 inch
	b. For exposed lintels, sills, and other conspicuous lines	In any bay or 20 feet maximum . . 1/4 inch In 40 feet or more . 1/2 inch
(3)	Variation of the linear building lines from established position in plan and related position of columns, walls, and partitions	In any bay or 20 feet maximum . . 1/2 inch In 40 feet or more . 1 inch
(4)	Variation in the sizes and locations of sleeves, floor openings, and wall openings	. . . . . 1/4 inch
(5)	Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls	Minus . . . . . 1/4 inch Plus . . . . . 1/2 inch
(6)	Footings:	
	a. Variation of dimensions in plan	Minus . . . . . 1/2 inch Plus . . . . . 2 inches
	b. Misplacement or eccentricity	2 percent of the footing width in the direction of misplacement but not more than . . 2 inches
	c. Reduction in thickness	Minus . . . . . 5 percent of specified thickness
(7)	Variation in steps:	
	a. In a flight of stairs	Rise . . . . . 1/8 inch Tread . . . . . 1/4 inch
	b. In consecutive steps	Rise . . . . . 1/16 inch Tread . . . . . 1/8 inch

TABLE II

CONSTRUCTION TOLERANCES FOR MASS CONCRETE STRUCTURES

(1)	All structures:	
	a. Variation of the constructed linear outline from established position in plan	In 20 feet . . . . . 1/2 inch In 40 feet . . . . . 3/4 inch In 80 feet or more . . 1-1/4 inch
	b. Variations of dimensions to individual structure features from established positions	In buried construction, twice the above amounts
(2)	a. Variation from the plumb, from the specified batter, or from the curved surfaces of all structures, including the lines and surfaces of columns, walls, piers, buttresses, arch sections, vertical joint grooves, and visible arisses	In 10 feet . . . . . 1/2 inch In 20 feet . . . . . 3/4 inch In 40 feet or more . 1-1/4 inches In buried construction, twice the above amounts
	b. Variation from the level or from the grades indicated on the drawings in slabs, beams, soffits, horizontal joint grooves, and visible arrises	10 feet . . . . . 1/4 inch In 30 feet or more . 1/2 inch In buried construction, twice the above amounts
(3)	a. Variation in cross sectional dimensions of columns, beams, buttresses, piers, and similar members	Minus . . . . . 1/4 inch Plus . . . . . 1/2 inch
	b. Variation in the thickness of slabs, walls, arch sections, and similar members	Minus . . . . . 1/4 inch Plus . . . . . 1/2 inch
(4)	Footings for columns, piers, walls, buttresses, and similar members:	
	a. Variation of dimension in plan	Minus . . . . . 1/2 inch Plus . . . . . 2 inches
	b. Misplacement or eccentricity	2 percent of footing width in the direction of misplacement but not more than . . . 2 inches
	c. Reduction in thickness	. . . . . 5 percent of specified thickness

d. Coating. - An approved colorless mineral oil, not darker than ASTM No. 3 in accordance with ASTM Standard D-1500, free of kerosene, with a viscosity of not less than 70 seconds nor more than 110 seconds (Saybolt Universal) at 100 degrees F., except that when used on hardboard forms, the viscosity shall be not less than 250 seconds at 100 degrees F. Flash point shall be not less than 300 degrees F. (open cup). Viscosity and flash point shall be determined in accordance with ASTM Standards D 88 and D 92, respectively. Certified copies of results of laboratory tests performed by an approved commercial laboratory shall be submitted for approval. After oiling, surplus oil on the form surfaces and any oil on the reinforcing steel or other surfaces requiring bond with the concrete shall be removed. Forms for unexposed surfaces may be thoroughly wetted in lieu of oiling immediately before the placing of concrete, except that in freezing weather oil shall be used.

e. Removal. - Forms shall not be removed without approval, and all removal shall be accomplished in a manner which will prevent injury to the concrete. Forms shall not be removed before the expiration of the minimum time indicated below, except as otherwise directed or specifically authorized.

Conduit roofs	144 hr
Beams and deck-type slabs	144 hr
Walls (lifts 15 ft. and under)	24 hr
Walls (lifts over 15 ft.)	48 hr
Mass concrete (face)	36 hr
Mass concrete (bulkhead)	48 hr
Conduit in open cut	72 hr

When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

9-17. FURNISHING AND PLACING STEEL REINFORCEMENT. - a. General. - The contractor shall furnish, cut, bend, and place all steel reinforcement including rods, fabric, and structural shapes as indicated on the drawings or otherwise required. All reinforcement shall be, when surrounding concrete is placed, free from loose, flaky rust, and scale, and free from oil, grease or other coating which might destroy or reduce its bond with the concrete. The contractor shall submit for approval shop drawings, bar lists and bending diagrams. Contract drawings show the basic steel requirements and are not necessarily complete as to layout of reinforcing steel. The contractor shall furnish complete steel placement shop drawings elaborating wherever necessary over what is shown on the contract drawings.

b. Cutting and Bending. - Steel reinforcement may be mill or field bent. All bending shall be in accordance with standard approved practice and by approved machine methods.

c. Reinforcement. - (1) Reinforcing steel for concrete shall conform to the requirements of ASTM Specification A15-62T, intermediate billet, deformed. Rail steel, ASTM Specification A16-62T, regular grade, deformed, or hardgrade billet steel, ASTM Specification A15-62T deformed, may be furnished for straight bars or shop bends only. Certified copies of all mill reports shall accompany all deliveries of reinforcing steel.

(2) Mesh reinforcement shall conform to the requirements of ASTM Specification A185-61T, and unless otherwise indicated on the drawings, shall be 6-inch mesh of No. 6 gage wire.

d. Spacing of Bars. - The spacing of bars shall be as shown on the contract drawings or as directed, and shall conform to the tolerances shown in Table III.

e. Relation of Bars to Concrete Surfaces. - The minimum cover for all main reinforcement shall conform to the dimensions shown on the drawings within the tolerances shown in Table III. The dimensions, as shown on the drawings, indicate the clear distance from the edge of the main reinforcement to the concrete surface. The concrete covering of stirrups, spacer bars, and similar secondary reinforcement may be reduced by the diameter of such bars.

TABLE III

CONSTRUCTION TOLERANCE FOR PLACING REINFORCING STEEL

(1)	Variation of protective covering	With 2-inch cover. . . . . 1/4 inch With 3-inch cover and over . . 1/2 inch
(2)	Variation from indicated spacing	. . . . . 1 inch

f. Splicing. - All splices in reinforcement shall be as shown on the drawings. Lapped ends of bars may be placed in contact and securely wired or may be separated sufficiently to permit the embedment of the entire surface of each bar in concrete. Adjacent sheets of mesh reinforcement shall be spliced by lapping not less than 6 inches, the lapped ends being securely wired or clipped together with standard clips.

g. Supports. - All reinforcement shall be secured in place by use of metal or concrete supports, spacers, or ties, as approved. Such supports shall be of sufficient strength to maintain the reinforcement in place throughout the concreting operation. The supports shall be used in such manner that they will not be exposed or contribute in any way to the discoloration or deterioration of the concrete.

9-18. EMBEDDED ITEMS. - a. Before placing concrete, care shall be taken to determine that all embedded items are firmly and securely fastened

in place as indicated on the drawings, or required. Embedded items including pipe and conduit, shall be free of oil and other foreign matter such as loose coatings of rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed.

b. Pipe Drains. - Asbestos cement pipe required for pipe drains and not required to be furnished under Section 7, shall be furnished, cut and embedded by the contractor under this section. The pipe shall conform to Federal Specification SS-P-351a, "Pipe Cement Asbestos", Class 150. Pipe will be of the diameter and in the locations indicated on the drawings. The pipe shall be cleaned thoroughly of all dirt, grease, oil, grout and mortar immediately before embedment, and shall be held firmly in position and protected from damage or displacement while the concrete is being placed. The contractor shall take all necessary precautions to prevent any pipe from becoming clogged or obstructed from any cause, and any pipe which becomes clogged shall be cleaned out in a manner satisfactory to the Contracting Officer at the contractor's expense.

9-19. MEASUREMENT AND PAYMENT. - a. Concrete. - Measurement of concrete will be made on the basis of the actual volume of concrete within the lines and grades of the structures as indicated on the drawings. Measurement of concrete placed against the sides of any excavation without the use of intervening forms will be made only within the indicated limits of the structure. No deductions will be made for rounded or beveled edges or space occupied by metal work, electrical conduits or timber, nor for voids or embedded items which are either less than 5 cubic feet in volume or one square foot in cross section. Unless otherwise specified, payment for concrete will be made at the respective contract prices per cubic yard for the various items of the schedule, which price shall include the cost of all labor, materials, and the use of all equipment and tools required to complete the concrete work; except the cement, reinforcement, and embedded parts which are specified to be paid for separately. No payment will be made for concrete, as such, which is placed in structures or in items for which payment is made as described in Subparagraph d, below. No payment will be made for expansion and contraction joint material, joint sealing materials, and pipe drains, and all costs in connection therewith shall be included in the applicable contract prices. No separate payment will be made for mortar and grout for miscellaneous purposes (except as provided under Item 23A) and all costs in connection therewith shall be included in the contract unit and lump sum prices for the items of work to which the work is incidental. Bidding schedule items for concrete under this contract are as follows:

(1) Concrete-Outlet Works-Inlet and Outlet. - This item includes all concrete placed in the outlet works except the conduit between Sta 3+93 to Sta. 7+77, but including wall at outlet end. Payment therefor will be made at the contract unit price per cubic yard for Item 21, "Concrete-Outlet Works-Inlet and Outlet".

(2) Concrete-Outlet Works-Conduit. - This item includes all concrete placed in the Outlet Works conduit from Sta. 3+93 to Sta. 7+77, except this item does not include the concrete wall at the outlet end. Payment therefor will be made at the contract unit price per cubic yard for Item 22, "Concrete-Outlet Works-Conduit Sta. 3+93 to Sta. 7+77".

(3) Concrete-Spillway-Weir and Walls. - This item includes all concrete placed in the spillway including walls and the weir. Payment therefor will be made at the contract unit price per cubic yard for Item 23, "Concrete-Spillway-Weir and Walls".

(4) Item 23A, "Concrete for Foundation Preparation". - See Section 5.

b. Portland Cement. - The quantity to be paid for under Item 24, "Portland Cement" will be the number of barrels (376 pounds net weight) of portland cement or portland blast furnace slag cement used unless specifically excepted, wasted or used for the convenience of the contractor. The quantity to be paid for will be determined by multiplying the theoretical batch weight of portland cement in each type of concrete used by the number of batches of concrete of the types placed within the pay lines of the structure, and dividing by 376. Payment shall be made at the contract price per barrel for the schedule item which price shall include the cost of required unloading, hauling, handling, and storage at the site, of all portland cement used in the work. No payment will be made for cement included under other items of work.

c. Reinforcement. - (1) Bars. - Measurement of reinforcing bars will be made on the basis of the lengths of bars placed in accordance with the approved drawings or bar schedules or as directed. The measured lengths will be converted to weights for the size of bars listed by the use of the unit weights per lineal foot stated on the applicable ASTM Specification. Steel in laps indicated on the drawings or required by the Contracting Officer will be paid for at the contract unit price. No payment will be made for the additional steel in laps which are authorized for the convenience of the contractor. Except as noted below, furnishing and placing reinforcement bars will be paid for at the contract unit price per pound for Item 25, "Steel, Reinforcement".

(2) No separate payment will be made for wire mesh reinforcement and all costs will be included in applicable contract price.

d. Other Items. - (1) Payment for concrete, cement, and reinforcing steel used in the following items, will be included under the applicable payment item for these items and no separate payment will be made therefor.

Description

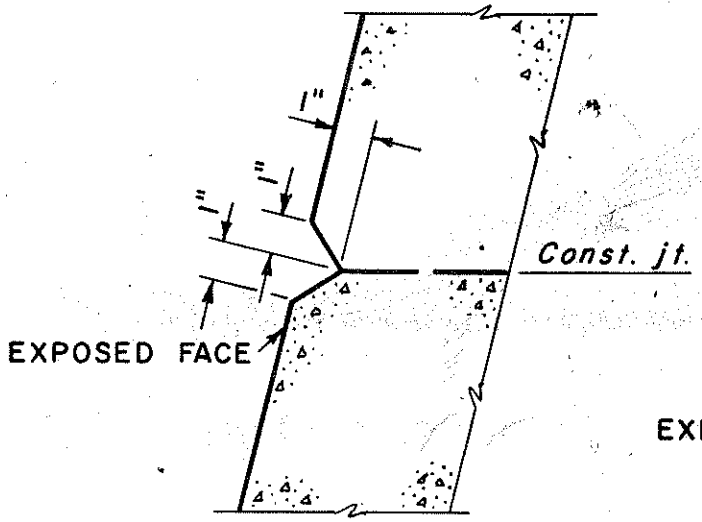
Cable Guard Rail and Posts
Chain Link Fencing and Gates
Bubble Gage Shelter Structure and Stairs
Concrete Pipe and Conduit
Storm Drainage Items

(2) Payment for cement used in the following items will be included under the applicable payment items, and no separate payment will be made.

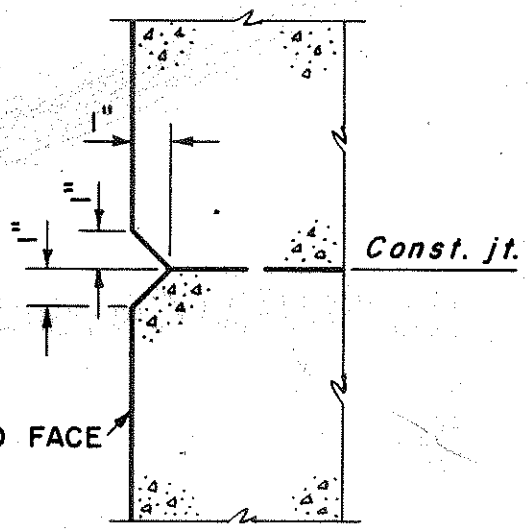
Description

Mortar for Foundation Preparation
Mortar for Masonry Work
Grout for Anchor Bars

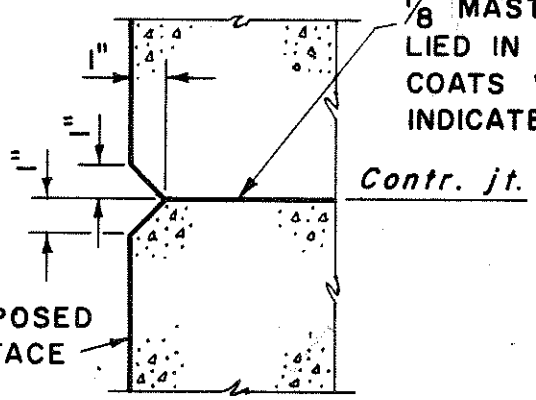
(3) Payment for cement used in grout under "Drilling and Grouting" will be made under Item 8e, "Portland Cement in Grout".



CONSTRUCTION JOINT
SLOPING FACE
(Const. jt.)

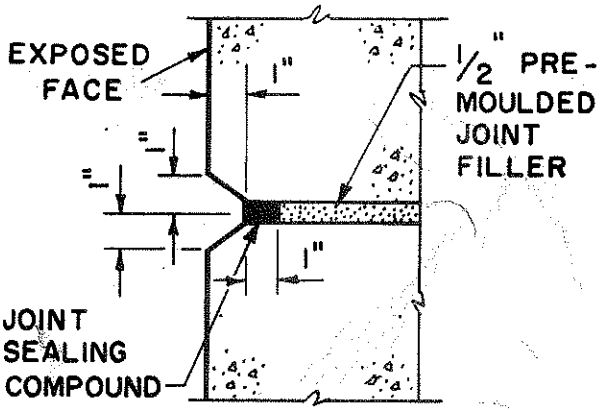


CONSTRUCTION JOINT
VERTICAL
(Const. jt.)

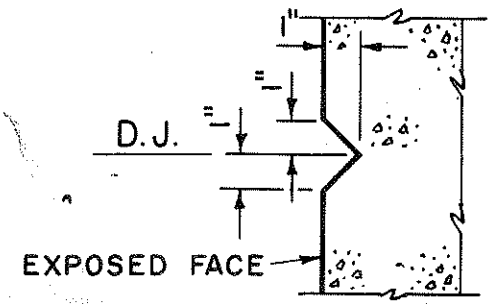


CONTRACTION JOINT (Contr. jt.)

HORIZONTAL CONSTRUCTION JOINTS SHALL BE FLUSH TYPE EXCEPT THAT GRAVITY WALLS SHALL BE "V" GROOVED AS SHOWN ABOVE.



EXPANSION JOINT (Exp. jt.)
(FOR FLOOD WALLS)



DUMMY JOINT (D.J.)

NOTE:

REINFORCING STEEL SHALL PASS THRU CONSTRUCTION JOINTS BUT NOT THRU CONTRACTION JOINTS.

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

STANDARD STRUCTURAL JOINT DETAILS

(NOT TO SCALE)

DWG. NO. STD-3 DATE: FEB. 1964

SECTION 10

CONCRETE PIPE CONDUIT
(Item 26)

INDEX

Paragraph No.	Paragraph Title	Page No.
10-01	Scope	10-1
10-02	Applicable Publications	10-1
	a. Federal Specification	10-1
	b. American Society for Testing and Materials Standards	10-1
	c. U.S. Army Corps of Engineers Handbook for Cement and Concrete	10-1
10-03	General	10-1
	a. Strength Requirements	10-2
	b. Responsibility and Certifications	10-2
10-04	Materials	10-2
	a. Concrete	10-2
	b. Reinforcement	10-3
	c. Rubber Gasket	10-3
10-05	Installation	10-3
	a. General	10-3
	b. Jointing	10-3
	c. Concrete	10-3
10-06	Payment	10-3

SECTION 10

CONCRETE PIPE CONDUIT
(Item 26)

10-01. SCOPE. - This section covers construction of the 3' - 0" diameter concrete pipe conduit, complete, including pipe supports.

10-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

a. Federal Specification. -

SS-C-00192f (COM-NBS)	Cement, Portland.

b. American Society for Testing and Materials Standards. -

A-15-62T	Billet-Steel Bars for Concrete Reinforcement.
A-31-55	Boiler Rivet Steel and Rivets.
A-185-61T	Welded Steel Wire Fabric for Concrete Reinforcement.
A-283-58	Low and Intermediate Tensile Strength Carbon Steel Plates of Structural Quality (Plates 2 in. and under in thickness).
A-432-62T	Deformed Billet Steel Bars for Concrete Reinforcement with 60,000 p.s.i. Minimum Yield Point.
C-33-63	Concrete Aggregate.
C-76-63T	Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
C-231-62	Air Content of Freshly Mixed Concrete by the Pressure Methods.
C-443-63	Joints for Circular Concrete Sewer and Culvert Pipe, Using Flexible Watertight, Rubber-Type Gaskets.

c. U. S. Army Corps of Engineers Handbook for Cement and Concrete.

CRD-C13-55 & Revs. 1957 - 1958	Air-Entraining Admixtures for Concrete.

10-03. GENERAL. - Concrete pipe shall conform to the applicable requirements of ASTM Standard C 76, except as modified hereinafter. The pipe

joint shall be sealed by a rubber gasket. Each length of pipe shall be provided with bell and spigot ends formed by steel joint rings securely fastened in the pipe wall. The spigot ring shall be lined with concrete on its interior surface and the bell ring shall be covered with concrete on its exterior surface. Portions of the joint rings which will be exposed after the pipe is manufactured shall be protected from corrosion by a metallic coating or equivalent applied by an approved method. The spigot ring shall have a groove for the purpose of receiving, holding and protecting the gasket. The steel for bell rings shall be 1/4 inch or more in thickness and shall conform to Grade A or B, ASTM Specification A-283. The steel for the spigot ends shall conform to Grade A, ASTM Specification A-31. The joint shall conform in all essential details with the rubber and steel joint for concrete pressure pipe as manufactured by Lock Joint Pipe Company. The pipe shall be cast vertically.

a. Strength Requirements. - (1) Compressive strength of concrete shall be not less than 5,000 p.s.i. at 28 days of age.

(2) Design load for pipe shall be as shown on the drawings. Not more than three lengths of pipe, selected at random shall be tested by the three edge bearing method to determine the load to produce a 0.01 inch crack and for ultimate strength. The test load required to produce a 0.01 crack using a load factor of 3.0 shall be based on a factor of safety of not less than 1.33. The test load required to produce failure shall be based on a factor of safety of not less than 2.0 using a load factor of 3.0. The contractor shall furnish the extra lengths of pipe for testing without charge. Test methods shall conform to the applicable requirements of ASTM Specification C-76.

b. Responsibility and Certification. - All tests performed on the pipe shall be observed by a representative of the Contracting Officer. The Government reserves the right to observe and inspect all phases of the manufacture and testing of the pipe. The contractor shall be responsible for having the materials, the concrete and pipe he proposes to furnish tested to demonstrate conformance to the applicable specifications. Certified copies of the test reports shall be delivered to the Contracting Officer, before the pipe is installed.

10-04. MATERIALS. - The following materials shall conform to the respective specifications and the requirements specified below.

a. Concrete. - Concrete shall be composed of Portland cement, fine and coarse aggregate, water and air-entraining admixture.

(1) Portland cement shall conform to Federal Specification SS-C-192, type II.

(2) Processed Aggregates. - Aggregates shall conform to ASTM Standard C33, except the grading requirements shall not apply.

(3) Air-entraining admixture. - The air-entraining admixture shall be any approved substance or compound which will produce entrained air in the concrete. The air-entraining admixture shall conform to Corps of Engineers Serial No. CRD-C13, and will be accepted on manufacturer's certification of compliance. The air content by volume shall be 6.0 percent plus or minus 1.0 percent as determined by ASTM Standard C231.

(4) Water. - Water used in mixing and curing concrete shall be fresh, clean, and suitable for use as drinking water.

b. Reinforcement. - Reinforcement steel shall conform to ASTM Standard A432, deformed, or ASTM Standard A15, hard grade, deformed. Welded wire fabric conforming to ASTM 185 will be acceptable. Reinforcing steel will be accepted on the basis of certified mill reports.

c. Rubber Gasket. - The gasket sealing the joint shall be made of rubber of special composition, having a texture to assure a watertight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of rubber gaskets for pipe joints. The gasket shall be in a continuous ring, of suitable cross section and of such size as to fill the groove on the spigot joint ring when the pipes are laid. The rubber gasket shall be the sole element depended upon to make the joint watertight and shall have smooth surfaces free from pitting, blisters, porosity and other imperfections.

10-05. INSTALLATION. - a. General. - The pipe shall be supported on chairs or other suitable means to substantially and uniformly support the pipe at the correct line and grade during placement of concrete. The pipe shall be anchored to prevent movement during placement of concrete. All pipe laying shall proceed from the intake transition with the tongue ends of tongue and groove pipe pointing upstream. Each pipe shall be laid true to line and grade and in such manner as to form a close joint with the adjoining pipe. As the work progresses, the interior of the pipe shall be cleared of all dirt, and superfluous material of every description. At times when work is not in progress, open ends of pipe and fittings shall be securely and satisfactorily closed so that no water, earth or other substance will enter the pipe or fittings.

b. Jointing. - The pipe shall be jointed in accordance with the manufacturer's recommendations. In making the joints on the interior of the pipe, special care shall be taken to assure a smooth surface with no projections or depressions.

c. Concrete. - After pipe has been installed, inspected and approved by the Contracting Officer, concrete shall be placed and compacted with vibration equipment to the indicated limits as specified under Section 9, CONCRETE.

10-06. PAYMENT. - Payment for all work specified in this section, except as specified below, will be made at the lump sum price for Item 26, "Pipe Conduit". Concrete and cement in connection with the concrete placed under or around the pipe will be paid for separately under the applicable payment items.

SECTION 11

EXCAVATION, TRENCHING, AND BACKFILLING FOR CULVERTS AND DRAINS
(INDEX)

Paragraph No.	Paragraph Title	Section No.
11-01	Scope	11-1
11-02	Excavation	11-1
	a. General	11-1
	b. Trench Excavations	11-1
	c. Excavation for Appurtenant Structures	11-2
11-03	Stream Diversion	11-3
	a. Large Culverts	11-3
	b. Other Culverts and Drains	11-3
	c. Excavation	11-3
11-04	Materials	11-3
	a. Pipe Bedding	11-3
	b. Culvert Backfill	11-3
	c. Earth Backfill	11-3
11-05	Placement and Compaction	11-3
	a. Pipe Bedding	11-3
	b. Backfilling	11-4
11-06	Measurement and Payment	11-5
	a. Large Culverts	11-5
	b. Other Culverts and Appurtenant Structures	11-6

SECTION 11

EXCAVATION, TRENCHING, AND BACKFILLING FOR CULVERTS AND DRAINS

11-01. SCOPE. - The work covered in this section of the specifications consists of furnishing all plant, labor, material, equipment, and appliances, and of performing all operations in connection with excavation, trenching, and backfilling for all culverts and drains and appurtenant structures, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

11-02. EXCAVATION. - a. General. - (1) Excavation for Large Culverts.- Excavations for the 17-foot diameter culvert at the Vinica Brook crossing, the 15-foot diameter culvert at the Conant Brook crossing, and the 54-inch diameter culvert in the vicinity of Station 62+50 on the Wales Road relocation shall be to the lines and grades indicated on the drawings or as directed by the Contracting Officer. All provisions of Section 3, "EXCAVATION" of these specifications shall be applicable to the excavations for these three large culverts.

(2) Excavations for other Culverts and Drains. - For all culverts and drains, except those covered in Subparagraph 11-02a (1) above, all excavation of every description and of whatever substances encountered shall be performed to the depths indicated or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excess material or material unsuitable for backfill, shall be removed and placed in spoil areas, embankments, and fills as directed. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel. Excavation shall be by open cut. Earth excavation shall comprise all materials not classified as rock excavation, and shall include clay, silt, sand, gravel, loose shale, loose stone, and boulders measuring less than 1/2 cubic yard in volume. Rock excavation shall comprise the following: boulders measuring 1/2 cubic yard or more in volume; rock material in ledges, bedded deposits, unstratified masses, and conglomerate deposits so firmly cemented as to possess the characteristics of solid rock that cannot be removed without systematic drilling and blasting; and concrete or masonry structures.

b. Trench Excavations. - Trenches for the pipes, other than the three large culverts described in Subparagraph 11-02a. (1) above, shall be of the necessary width for the proper laying of the pipe and placement and

compaction of backfill. Trench widths shall be sufficient to leave at least 24 inches in the clear between the sides of the pipe and the sides of the trench. The banks of the trenches shall be as nearly vertical as practicable. Care shall be taken not to over-excavate except as otherwise specified, hereinafter. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for the proper sealing of pipe joints and as hereinafter specified. Depressions for joints shall be dug after the trench bottom has been graded, and, in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, the depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing. Where rock excavation, as defined hereinbefore, is required in trenches for pipe, the rock shall be excavated to a minimum overdepth of 8 inches below the trench depths indicated or specified and the overdepth filled with compacted pipe bedding material. Except as hereinafter specified for wet or otherwise unstable material, all other overdepths shall be backfilled as and with materials specified for backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in the bottom of the trench, such material shall be removed to the depth required and the trench backfilled to the proper grade with compacted pipe bedding material as specified in Paragraph 11-04 below. Where the pipe will be completely or partially surrounded by compacted highway fill, the fill shall be placed in accordance with the applicable specifications to a level 2 feet higher than the top of the pipe or to finished subgrade level, whichever is lower, and a trench shall then be excavated as described above, except where the highway fill consists of rockfill material, in which case the trench shall be excavated to a minimum overdepth of 12 inches below the trench depths indicated or specified and the overdepth shall be filled with compacted pipe bedding material. The bottom of the trench for any pipe over 24 inches in diameter shall be shaped to conform with the outer surface of the pipe to a minimum height of 6 inches above the pipe invert so that the pipe will rest firmly on undisturbed soil or pipe bedding for as nearly the full length of the barrel as proper jointing operations will permit.

c. Excavation for Appurtenant Structures. - Excavation for drain inlets and similar structures shall be sufficient to leave at least 24 inches in the clear between the outer surfaces and the embankment or timber that may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed by the Contracting Officer will be considered unauthorized and shall be refilled with pipe bedding or concrete, as directed, at no additional cost to the Government.

11-03. STREAM DIVERSION. - a. Large Culverts. - The control and diversion of water in connection with the three large culverts is specified and included under Section 2, "CONTROL AND DIVERSION OF WATER".

b. Other Culverts and Drains. - All streams which may interfere with the proper construction of the culverts and appurtenant structures shall be diverted during the construction period by methods approved by the Contracting Officer.

c. Excavation. - No excavation or diversion will be permitted close enough to a pipe excavation to interfere with the specified width of pipe bedding and culvert backfill.

11-04. MATERIALS. - a. Pipe Bedding. - Material for use as pipe bedding shall meet all the requirements, including approval, as stated in Section 5, "EMBANKMENTS, DAM AND DIKE" for sand fill material except that the pipe bedding material shall contain no stones larger than 3 inches in any dimension.

b. Culvert Backfill. - Material for use as culvert backfill for the large culverts at the Vinica Brook and Conant Brook crossings and in the vicinity of Station 62+50 on the Wales Road relocation shall meet all the requirements, including approval, as stated in Section 5, "EMBANKMENTS, DAM AND DIKE" for gravel fill material except that the culvert backfill material shall contain no stones larger than 4 inches in any dimension.

c. Earth Backfill. - Materials for use as earth backfill for all culverts other than the three large culverts and for appurtenant structures shall consist of approved earth materials from the trench excavations, other required excavations, or borrow excavation from which all oversize stones as defined in Paragraph 11-05 have been removed.

11-05. PLACEMENT AND COMPACTION. - a. Pipe Bedding. - In general, approved pipe bedding material shall be dumped and spread in approximately horizontal layers not over 6 inches in thickness and each layer shall be compacted with 6 coverages of the tread of a crawler-type tractor weighing at least 20,000 pounds. In areas where the tractor cannot operate due to space limitations, pipe bedding material shall be spread in 4-inch layers and compacted with the power tamper or surface vibrator specified in Section 5 "EMBANKMENTS, DAM AND DIKE", in the manner specified in the same section for the compaction of gravel backfill. Pipe bedding material for the three large culverts shall be placed and compacted for the full heights indicated on the drawings and then re-excavated to provide a shaped surface for the bottom of the pipe conforming to the surface of the pipe bottom. Pipe bedding material for all other pipes larger than 24 inches in diameter shall be placed and compacted to at least 6 inches above the pipe invert grade and similarly re-excavated. Pipe bedding material for pipes having

diameters of 24 inches or less shall be placed and compacted to pipe invert grade. Shaping of the pipe bedding as specified above shall be done manually by men skilled in this type of work in such a manner that the pipe shall rest firmly on compacted bedding material for as nearly the full length of the barrel as proper jointing operations will permit. The shaping of the bedding shall be done only a few feet in advance of the laying of the pipe. Areas in which pipe bedding is to be placed shall be dewatered completely prior to placement of the pipe bedding material.

b. Backfilling. - (1) General. - No backfill for any culvert or appurtenant structure shall be placed until the foundation clean-up, pipe bedding as required, and installation of the pipe or structure have been completed and approved and until the unit, as installed, conforms to the requirements specified herein and in other pertinent sections of the specifications. All backfill areas shall be completely dewatered prior to placement of backfill.

(2) Backfilling for Large Culverts. - Backfilling for the large culverts at the Vinica Brook and Conant Brook crossings and in the vicinity of Station 62+50 on the Wales Road relocation shall be performed to the lines, grades, and cross sections indicated on the drawings or as modified by the Contracting Officer. Backfill materials for these culverts shall consist of approved culvert backfill material spread by hand shovelling in approximately horizontal layers not exceeding 4 inches in thickness and compacted by power tamper or surface vibrators in the manner specified for gravel backfill in Section 5 "EMBANKMENTS, DAM AND DIKE". Special means shall be used to maintain the surface of the backfill at the same level on both sides of the pipe at all times so as to prevent movement or distortion of the pipe. Special care shall be exercised to obtain thorough compaction of the backfill material under the haunches of the pipe. During spreading of the culvert backfill material all stones larger than 3 inches in any dimension shall be removed from those portions of the layer within 12 inches of the outer surface of the pipe. Layers of backfill placed 24 inches or more above the top of the pipe may be compacted by 6 coverages of the rear wheels of an approved rubber tired farm tractor weighing 2 tons or less in lieu of compaction by power tamper or surface vibrator. The rate at which culvert backfill is placed and compacted shall be such that the backfill surface shall be at least 6 inches and no more than 24 inches above that of the adjacent highway fill. Layers of highway fill material spread within 20 feet of the sides of the pipe shall be compacted only by the crawler type tractor, power tamper, or surface vibrator. No compaction or hauling equipment shall be allowed to operate on any layer of culvert backfill material other than the power tamper, surface vibrator, or rubber tired farm tractor.

(3) Backfill for Other Culverts. - (a) Lower Portion of Trench. - This subparagraph covers the backfilling for culverts (other than the three large culverts covered in (2) above) up to the level of the finished subgrade or to a level 2 feet above the top of the pipe, whichever is the lower. The lower portion of the trench shall be backfilled with approved earth backfill material from which all stones larger than 3 inches have been removed. The material shall be spread by hand in approximately horizontal layers not exceeding 4 inches in thickness. Each layer shall be compacted as specified for the culvert backfill in (2) above. Beneath the pipe haunches where there is not adequate space for the proper operation of the power tamper or surface vibrator, small hand tools shall be used to firmly compact the backfill materials.

(b) Remainder of Trench. - Backfill placed in the upper portions of the trenches covered in (a) above shall consist of approved earth backfill material from which all stones larger than 6 inches in any dimension have been removed. Each layer shall be spread to a thickness no greater than 6 inches and compacted as specified for the culvert backfill in (2) above.

(4) Appurtenant Structures. - Backfilling for inlets and other appurtenant structures shall be placed and compacted as specified in (3)(a) above for backfilling for culverts.

11-06. MEASUREMENT AND PAYMENT. - a. Large Culverts. - All excavations for the large culverts at the Vinica Brook and Conant Brook crossings and in the vicinity of Station 62+50 on the Wales Road relocation will be measured and paid for in accordance with Section 3, "EXCAVATION" under Item 3, "Unclassified Excavation - General", and Item 5, "Rock Excavation". The quantities of compacted pipe bedding and compacted culvert backfill to be paid for will be the volumes computed from the lines, grades, thicknesses, and limits indicated on the drawings, specified herein, or modified by the Contracting Officer. The limits of sections of bedding and backfill which are not definite on the drawings or as stated in these specifications and depend upon topography and field conditions shall be determined by field surveys. The measurement shall not include volumes of materials placed outside the limits shown on the drawings, specified, herein,or directed by the Contracting Officer. Compacted pipe bedding and compacted culvert backfill satisfactorily placed and measured as stated above will be paid for at the applicable contract unit prices per cubic yard for Item 36, "Pipe Bedding" and Item 36A, "Culvert Backfill". Such payment shall constitute full compensation for all work in connection with placement, compaction, furnishing materials, and all other incidental work required for the construction, protection, and maintenance of backfill and bedding sections. Payment for Item 36, "Pipe Bedding" shall also include full compensation for the shaping of the bedding surface to fit the bottom of the pipe. Stream diversion is specified and included under Section 2, "CONTROL AND DIVERSION OF WATER".

b. Other Culverts and Appurtenant Structures. - No separate payment will be made for stream diversions, excavation, trenching, and backfilling for culverts and drains and appurtenant structures (other than the three culverts covered in a above) except as otherwise specified below. This work shall constitute a subsidiary obligation of the contractor and payment therefor will be included in the applicable contract unit price for the particular culvert or structure involved. Any rock excavation encountered will be classified and measured for payment and paid for as specified for rock excavation in Section 3, "EXCAVATION" except that all boulders measuring over 1/2 cubic yard will be classified as rock excavation. Pipe bedding as required for these culverts, including material to replace removal of unsuitable material from trench bottoms, will be measured for payment as the number of cubic yards actually placed and will be paid for as specified in a above.

SECTION 12

STORM DRAINAGE SYSTEM
(Items 28 through 35, inclusive, and 52)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
12-01	Scope	12-1
12-02	General	12-1
12-03	Materials	12-1
12-04	Excavation, Trenching, Bedding and Backfilling for Pipe and Drop Inlets	12-1
12-05	Rock Slope Protection for Aprons	12-1
12-06	Paved Ditches	12-1
12-07	Removal of Debris from the Existing Culverts	12-2
12-08	Payment	12-2
	a. Culverts and Drains, 30" and Smaller	12-2
	b. Drop Inlets (Type C)	12-2
	c. Three Large Culverts	12-2
	d. Rock Slope Protection and Gravel Bedding	12-3
	e. Cleaning Culverts	12-3

SECTION 12

STORM DRAINAGE SYSTEM

(Items 28 through 35, inclusive and 52)

12-01. SCOPE. - This section covers the storm drainage system, including pipe culverts and drains, drop inlets, aprons, and concrete collars, complete.

12-02. GENERAL. - All work and materials in connection with the construction of the storm drainage system shall conform to Sections D-1 and D-4 of the Massachusetts Standard Specifications (See Paragraph SC-60) except as hereinafter modified).

12-03. MATERIALS. - a. Pipe for culverts (15-inch through 54-inch, inclusive) shall be asphalt coated corrugated metal pipe. The 15-foot and 17-foot culverts shall be bituminous coated multi-plate pipe and shall conform to the requirements of Section D-4 and Addendum D-4 of the Massachusetts Standard Specifications.

b. Drop inlets (Type C) shall conform to the requirements of Section D-1 of the Massachusetts Standard Specifications and to the details of design as shown on the Massachusetts Construction Standards for Type "C" drop inlets.

c. Concrete for collars and drop inlets shall conform to the applicable portions of Section 9, "CONCRETE", of these specifications.

12-04. EXCAVATION, TRENCHING, BEDDING, AND BACKFILLING FOR PIPE AND DROP INLETS. - Excavation, trenching, bedding and backfilling for pipe and drop inlets shall be in accordance with the applicable portions of Section 11, "EXCAVATION, TRENCHING, AND BACKFILLING FOR PIPE CULVERTS AND DRAINS". Details are shown on the drawings of the methods and materials to be used in backfilling and compacting the trenches for the 54-inch, 15-foot and 17-foot diameter culverts.

12-05. ROCK SLOPE PROTECTION FOR APRONS. - Rock slope protection for aprons shall be in accordance with the applicable portions of Section 6, "ROCK SLOPE PROTECTION, GRAVEL BEDDING AND ROAD GRAVEL".

12-06. PAVED DITCHES. - Paved ditches shall be constructed as specified in Section D-8 of the Massachusetts Standard Specifications, except as otherwise specified. The ditch paving shall consist of a 9-inch gravel base and a 3-inch bituminous mixture paving. Gravel base shall conform to the requirements for gravel base courses for roads as specified in Section 4, "GRAVEL BASE AND SURFACE COURSES". Bituminous paving mixtures shall

conform to the material requirements specified in Paragraph 15-04 for top and binder course material. Gravel surface shall be primed as specified in Paragraph 15-03 prior to placement of the bituminous paving mixture. Bituminous mixture shall be placed in two courses (1-1/2 inch binder and 1-1/2 inch surface). Mixtures shall be well compacted using tampers weighing not less than 25 pounds and with a tamping face of 50 square inches or other approved methods. The surface of the top mixture after compaction shall be smooth and true to the indicated lines and grades.

12-07. REMOVAL OF DEBRIS FROM THE EXISTING CULVERTS. - Removal of debris from the existing culverts and cleaning shall be performed to the satisfaction of the Contracting Officer. Flow conditions shall be restored to allow the efficient entrance and discharge of storm water at the culverts. (See Paragraph 1-06).

12-08. PAYMENT. - a. Culverts and Drains, 30" and Smaller. - All storm drains and culverts with the exception of the 54-inch culvert and the 15-foot and 17-foot multi-plate culverts shall be measured for payment along the centerlines of the pipe from end of pipe to end of pipe or from the outside wall of drop inlets to the end of the pipe. Pipe will be paid for at the applicable contract unit price for Items 28 through 31, inclusive, "Pipe, ACCM", based on the number of linear feet of culverts or storm drains placed in the accepted work, payment of which will constitute full compensation for all pipe, joints, and bedding, including trenching and excavation (except rock), backfill and compaction and all incidental labor and material necessary to complete the construction of culverts or storm drains as required by this section of the specifications and all references included herein.

b. Drop Inlets (Type C). - Each inlet will be considered one complete unit. The quantity of inlets to be paid for will be the total number of inlets complete with frames and gratings constructed to the depths indicated on the drawings. Payment under Item 35, "Drop Inlets (Type C)", will constitute full payment for all excavation, form work, concrete, cement, reinforcing steel, backfill and compaction, materials, and labor necessary to complete the construction.

c. Three Large Culverts. - The 15-foot and 17-foot culverts will each be paid for at the applicable lump sum contract prices for Items 33 and 34, "Pipe, Culvert, Bituminous Coated Multi-Plate". The 54-inch culvert will be paid for at the lump sum price for Item 32, "Pipe, Culvert, ACCM, 54-inch". Payment for these items shall include all costs including bituminous multi-plate of corrugated pipe, as applicable, hook bolts, concrete collars and end walls including cement and reinforcing steel, and all incidental labor and materials necessary to complete the construction of these culverts as required by the drawings, this section of the specifications, and references included herein, except rock slope protection, stream diversion, excavation, bedding, filling and backfilling.

d. Rock Slope Protection and Gravel Bedding. - Rock slope protection and gravel bedding for aprons shall be measured in place and the quantity to be paid for shall be the number of cubic yards constructed to the dimensions shown on the drawings. Rock slope protection shall be paid for under Item 19, "Rock Slope Protection". Gravel bedding shall be paid for under Item 16, "Gravel Bedding". Payments will constitute full payment for all excavation and labor necessary to complete the construction.

e. Cleaning Culverts. - No separate payment will be made for removal of debris and cleaning of existing culverts where indicated. All work in connection with this work will be considered a subsidiary obligation of the contractor to be included under Item 1, "Preparation of Site".

f. Paved Ditches. - Paving will be measured in place by the square yard. Payment will be made at the contract unit price per square yard for Item 52, "Paved Ditches", which price shall include all costs in connection therewith, except excavation, necessary for complete construction of the paved ditches including foundation preparation and base course.

SECTION 13

BUBBLE GAGE SHELTER
(Item 27)
(Index)

Paragraph No.	Paragraph Title	Page No.
13-01	Scope	13-1
13-02	Drawings for Approval	13-1
13-03	Excavation and Backfilling	13-1
	a. General	13-1
	b. Excavation	13-1
	c. Bubble Gage Shelter Fill	13-1
	d. Rock Slope Protection	13-1
13-04	Concrete	13-2
13-05	Miscellaneous Metals	13-2
	a. Metal Threshold	13-2
	b. Weatherstripping	13-2
	c. Channel Frame	13-2
	d. Floor Drain	13-2
13-06	Pipe Railing	13-2
	a. Fabricated	13-2
	b. Anchorage	13-3
13-07	Steel Ladders	13-3
13-08	Metal Gratings and Frames	13-3
13-09	Hollow Metal Door	13-3
	a. General	13-3
	b. Material	13-3
	c. Louver Guards	13-4
	d. Painting	13-4
	e. Hardware	13-4
13-10	Gage Conduit	13-4
13-11	Wood Shelf	13-5
13-12	Painting	13-5
13-13	Bronze Plaque	13-5
13-14	Payment	13-5

SECTION 13

BUBBLE GAGE SHELTER
(Item 27)

13-01. SCOPE. - This section covers the Bubble Gage Shelter, complete, including concrete stairs and pipe railings.

13-02. DRAWINGS FOR APPROVAL. - Before furnishing door, including threshold and weatherstripping for door bottom, detailed shop drawings supplemented by descriptive data and the hardware schedule, shall be submitted for approval.

13-03. EXCAVATION AND BACKFILLING. - a. General. - All work shall be executed to the lines and grades shown on the drawings or approved by the Contracting Officer.

b. Excavation. - Except as otherwise specified in Section 6, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL, the dam embankment shall be completed prior to excavation required for construction of the Bubble Gage Shelter. Excavation required for the construction of the Bubble Gage Shelter shall not proceed until directed by the Contracting Officer. Excavations shall conform to the dimensions and elevations shown on the drawings. Where the excavation is made below the elevations indicated on the drawings or directed, the heights of the wall shall be increased, as directed. Excavation shall generally extend 24 inches outside the walls to allow for placing and removal of forms, installation of the bubble gage conduit, floor drain pipe, and for inspection. Undercutting will not be permitted.

c. Bubble Gage Shelter Fill. - Bubble gage shelter fill shall consist of material conforming to the requirements as specified in Section 5, EMBANKMENTS - DAM AND DIKE, for gravel fill. Prior to the placement of bubble gage shelter fill, foundation walls shall be completed, all forms shall be removed, and the foundation areas for the fill shall be cleared of all trash and debris. Bubble gage shelter fill to be placed in the areas beneath the stairways and in areas contiguous thereto for a horizontal distance of 3 feet shall be placed and compacted as specified for gravel backfill in Section 5, EMBANKMENTS - DAM AND DIKE. All other gage shelter fill shall be placed in 12-inch layers without compaction other than that incidental to construction operations. Bubble gage shelter fill shall not be placed adjacent to the bubble gage shelter until at least 14 days after its completion.

d. Rock Slope Protection. - Rock slope protection material to be placed in the trench provided for the gage conduit, and as a result of the construction of the bubble gage shelter, shall meet all of the requirements for rock slope protection as stated in Section 6, ROCK SLOPE PROTECTION, GRAVEL BEDDING, AND ROAD GRAVEL, except as otherwise specified herein. Rock slope protection material in the trench provided for the

gage conduit, in the immediate vicinity of the bubble gage shelter and in other limited areas shall be placed by hand. Extreme care should be exercised to prevent damage to the gage conduit, discharge pipe for floor drain, or the bubble gage shelter. The rock slope protection shall not be placed adjacent to the bubble gage shelter until at least 14 days after its completion.

13-04. CONCRETE. - All concrete work required for the building and stairs shall conform with the applicable requirements of Section 9, CONCRETE.

13-05. MISCELLANEOUS METALS. - a. Metal Threshold. - The door threshold shall be an interlocking weatherstrip type threshold, 5" x 5/8", fabricated from non-ferrous metal with a non-slip top surface, shall be bedded in calking compound, and shall be anchored to the concrete by means of bolts set in expansion sleeves.

b. Weatherstripping. - Materials in connection with weather-stripping door bottom shall be No. 9 gage standard sheet (not ribbon) zinc, cut across the grain. Weatherstripping shall not react against type of threshold furnished.

c. Channel Frame. - Frame for door shall be structural steel channel. Stop shall be of structural steel bar stock plug welded to channel jambs and head. Frame shall be provided with four anchors to each jamb. Frame shall be notched as required to receive hardware.

d. Floor Drain. - The contractor shall furnish and install a floor drain and discharge piping. Discharge piping shall extend into rock slope protection. Discharge pipe shall conform to Federal Specification SS-P-356, 4-inch. Floor drain shall conform to Federal Specification WW-P-541b, type 224, 4-inch pipe discharge.

13-06. PIPE RAILINGS. - All pipe railing at Bubble Gage Shelter, including railing along stairs, shall be standard weight mild steel pipe conforming to Federal Specification WW-P-406b, except that bend sections shall conform to Federal Specification WW-P-404c. Pipe shall be 1-1/2 inch standard weight. All pipe shall be hot dip galvanized after manufacture.

a. Fabricated. - Jointing of post rail and corners shall be by mitered and welded type joints.

(1) Mitered and welded joints shall be made by fitting post to top rail and intermediate rail to post, mitering corners, grooving welding joints and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6 inches long.

(2) Railing may be bent at corners in lieu of mitering and welding or by using fittings, provided all such bends are made in suitable jigs and that the cylindrical cross section of the pipe be maintained through the entire bending.

b. Anchorage. - Posts shall be set into 6-inch sleeve inserts set and anchored in the concrete. Posts shall be inserted in sleeves, leveled, plumbed and calked solid with molten lead or lead wool and anchorage joint shall be covered with pipe collar pinned to post. Ends of rails shall be secured by means of standard steel pipe flanges anchored to concrete with expansion bolts.

13-07. STEEL LADDER. - Steel ladder shall be of the bar and rung type, constructed of structural steel in accordance with the details and the following minimum requirements. Stringers shall be a minimum 3/8-inch by 2-1/2 inch mild steel bars fitted with anchors, as shown, for securing to concrete. Rungs shall be 3/4 inch minimum round, solid section steel rods, fitted into punched holes in stringers, welded and ground smooth. Ladder shall be secured at each end. Install galvanized pipe grab bar where indicated.

13-08. METAL GRATINGS AND FRAMES. - Metal gratings shall conform to the requirements of Federal Specification RR-G-66la, Type I. Edges of all gratings shall be banded, and all gratings shall be hot dip galvanized. Frames shall be of standard steel angles and shall be all-welded construction, and galvanized to match gratings. Frames shall be provided with welded-on anchors.

13-09. HOLLOW METAL DOOR. - a. General. - The contractor shall furnish all material and hardware for, and install complete, the entrance door as indicated on the drawings. Door shall be provided with two insect screened weatherproof louvers. Screens shall be of non-ferrous metal and shall be on rewireable frame.

b. Material. - All material, except as otherwise specified, shall be factory fabricated from leveled steel, shall conform to ASTM A 366-62T; face plate shall be 1/4-inch steel plate or 3 gage sheet steel conforming to ASTM A 366. Gages referred to are all U. S. Standard and are the minimum acceptable for this work. Door shall be of the flush type, hollow metal construction, 2-inches thick. Except for exterior face plate and as otherwise specified, all material shall be of 16-gage stock. Top and bottom of door shall have stiffener channels welded to side plates, and shall be reinforced by formed steel, Z-bar sections extending full height and spaced not over 6 inches on centers. Sound-deadening cork board strips shall completely fill each space. Exposed welds shall be ground to true, even plane with no grinding marks visible. Door shall be free from warps, dent, or buckles. Door shall be properly reinforced for hardware and shall be drilled and tapped for application of hardware. Backing for hardware shall be not less than 1/8-inch thick

and heavier where necessary to develop full strength of machine screws. Door shall be mortised for butts and reinforcement provided by door manufacturer. Joints and miters shall be welded full length of hair line joints. Fourteen-gage reinforcements shall be provided for lock and lock strike. All reinforcements shall be securely welded in place. Mortises shall be neat and carefully fitted to hardware items. Any voids between metals and all mortises where hinges pass through rebates shall be filled with metal welded in place. A weather drip strip of 1/8" x 2" bent galvanized steel shall be applied to bottom and set to clear threshold.

c. Louver Guards. - Door guards shall be 1-1/2 inch wire mesh square grilles composed of 3/16" x 1/16" flat wire. The ends of mesh shall be hooked and welded to a 3/8-inch diameter steel frame. Steel strap lugs, 1/8-inch thick by 1-1/2 inch wide, shall be bent around and welded to bar frame; straps shall be provided at each corner and not over 18 inches apart elsewhere. Straps shall be bolted to door with 3/8-inch carriage bolts or prison-type bolts extending through the door. In any event fastenings shall be made tamperproof.

d. Painting. - The door including grilles and louvers shall be shop painted in accordance with the standard practice of the manufacturer. The door before assembling shall be cleaned, filled and ground smooth, where necessary, given a phosphate treatment, and primed with one shop coat of rust resistant paint standard with manufacturer. The door shall be finish painted as specified in Paragraph, PAINTING.

e. Hardware. - The door shall open from the left, and shall have 1-1/2 pairs of butts and a lockset as follows:

Butts - 1/2 pair, Type T-2147 USP, 5", non-rising, non-removable pins when door is closed (weld jamb leaf). (Federal Specification FF-H-116c). Olite bearing butts may be furnished at contractor's option. The type shown is minimum; actual thickness of metal and pin diameter as required to properly support door.

Lock, Type 86 EW-5S (Federal Specification FF-H-106a).

13-10. GAGE CONDUIT. - The contractor shall furnish and install under this section, the pipe conduit for the gage recording system. Conduit including fittings and bends, shall conform to Federal Specification WW-P-406a, Weight A, Class 2. Pipe shall be laid so that no low points occur along the line of the pipe. Pipe shall be provided with taper-threaded ends and joints by zinc-coated couplings. The joints shall provide a watertight joint. The contractor shall delay placing rock slope protection in locations where the conduit is to be placed until conduit has been placed. Care shall be exercised in placing rock slope protection in order to avoid damage to pipe, including galvanizing treatment, and to avoid any change in the line and grade of the pipe. The interior of the conduit shall be free from obstructions. The contractor shall install a No. 10 pulling wire in the conduit. Gage inlet shall be as indicated; all bolts and washers shall be corrosion resisting steel.

13-11. WOOD SHELF. - Shelving, including supports and nailers, of thickness indicated shall be free from knotholes, loose or unsound knots, wane, decay, and splits longer than the width of the piece. Shelving, including supports, etc., shall be pressure treated in accordance with Federal Specification TT-W-571g.

13-12. PAINTING. - a. All ferrous metal items specified in this section, including door, door frames and ladders, shall be painted. Galvanized metal and wood surfaces shall not be painted. Corrosion resisting steel shall not be painted.

b. All ferrous metals, unless specified to receive special partial treatment in the place of manufacture, shall be solvent cleaned and wire brushed followed by one prime coat of red lead paint conforming to Federal Specification TT-P-86c, Type I. All ferrous metal surfaces shall receive two finish coats of synthetic gloss enamel conforming to Federal Specification TT-E-486c and Am-3, Class A. In lieu of specified treatment, door may be completely finish painted in the shop in accordance with manufacturer's practice where specifically approved. Color of all finish paint shall be 16492-Gray (Fed. Std. No. 595).

13-13. BRONZE PLAQUE. - a. General. - The contractor shall furnish and install a bronze plaque where shown and as hereinafter specified.

b. Materials. - (1) Bronze casting shall conform to Federal Specification QQ-L-225, composition standard with manufacturer.

(2) Other items shall conform to the current standard practice for material required and use intended.

c. Construction. - The size and thickness of the plaque are indicated. The plaque border shall be raised and the edge shall be beveled. Both the raised border and the beveled edge shall be polished a bright finish. The plaque background shall have a sunken, matte surface with a statuary bronze finish. The letters shall be hand tooled, flat faced and polished to a bright finish. The plaque shall be furnished with four expansion bolts for securing to wall and with four rosettes.

13-14. PAYMENT. - Payment for all work specified in this section including cement, reinforcement and concrete pipe conduit and inlet for gage, plaque, railings, floor drain and discharge piping, excavation and backfilling, and painting and all costs in connection therewith shall be included in the lump-sum contract price for Item 27, "Bubble Gage Shelter".

SECTION 14

MISCELLANEOUS ITEMS OF WORK
(Item 37 through 43, Inclusive)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
14-01	Scope	14-1
14-02	Chain Link Fencing	14-1
	a. General	14-1
	b. Material and Description	14-1
	c. Payment	14-2
14-03	Log Boom	14-2
	a. General	14-2
	b. Materials	14-2
	c. Construction	14-2
	d. Payment	14-3
14-04	Staff Gages	14-3
	a. General	14-3
	b. Construction	14-3
	c. Payment	14-3
14-05	Miscellaneous Metal Items-Intake and Outlet Structures	14-3
	a. General	14-3
	b. Pipe Railing	14-3
	c. Structural Steel	14-4
	d. Hollow Structural Tubing	14-4
	e. Metal Fasteners	14-4
	f. Installation	14-4
	g. Painting	14-4
	h. Payment	14-4
14-06	Epoxy Coating - Field Applied	14-4
	a. General	14-4
	b. Surface Preparating	14-4
	c. Application of Epoxy Resin Binder	14-4
	d. Payment	14-5

Paragraph No.	Paragraph Title	Page No.
14-07	Highway Guard Rail	14-5
	a. Highway Cable Guard Rail	14-5
	b. Measurement and Payment	14-5
14-08	Bumper Guard	14-5
	a. General	14-5
	b. Materials	14-5
	c. Installation	14-5
	d. Painting	14-6
	e. Payment	14-6
14-09	Existing Fences - Removed and Reset	14-6
	a. General	14-6
	b. Payment	14-6
14-10	Mail Boxes, Signs, etc., Removed and Reset	14-6
	a. General	14-6
	b. Installation	14-6
	c. Payment	14-6
14-11	Concrete Bounds	14-7

SECTION 14

MISCELLANEOUS ITEMS OF WORK
(Item 37 through 43, Inclusive)

14-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with miscellaneous work items listed below, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

14-02. CHAIN LINK FENCING. - a. General. - Chain link fencing, four feet in height, and chain link gates shall be installed where and as shown on the drawings or directed. Fencing shall conform to Drawing No. 40-16-08, attached at end of this section. Fencing shall be braced at changes in directions and at ends, in accordance with manufacturer's recommendations.

b. Material and Description. - (1) Posts shall be galvanized and shall be in accordance with Federal Specification RR-F-183. The line posts shall be spaced not more than 10 feet on centers and embedded in the manner and depth shown on the drawings. All posts shall have an ornamental ball top.

(2) The fencing fabric shall conform to the requirements of Federal Specification RR-F-191a, Type A. The fencing shall be set to line and grade as shown on the drawings or as directed. The fence shall have a top rail and a tension wire along bottom of fabric.

(3) Aluminum fabric ties of suitable gage shall be provided for attaching the wire mesh to the posts.

(4) Gates shall be constructed with malleable iron fittings securely braced and trussed up with welded connections. Gates shall be filled with fabric to match fencing. Gates shall be equipped with pivot type malleable iron hinges, padlock, keepers, gate shoe and stops. Gates shall be equipped for locking at the top, middle, and bottom with the middle lock arranged for padlocking. A padlock with chain and three keys (and conforming to Federal Specification FF-P-101c, Type EPC, size 2 inch) shall be provided for each set of gates. All padlocks shall be keyed alike.

(5) A "closed" sign shall be mounted on each leaf of each set of gates. The signs shall be made of galvanized sheet steel (12 gage) properly reinforced. All surfaces shall be primed and then finished with two coats of exterior white paint. Lettering shall be done by a sign painter using a reflectorized type of paint.

(6) The fencing shall be constructed and installed as herein specified and in accordance with the best methods for workmanship adopted for this type of work in accordance with manufacturer's instructions and shall be pursued to a satisfactory completion as approved by the Contracting Officer.

c. Payment. - Payment for furnishing and installing chain link fencing (except gates) will be made at the contract unit price per lineal foot for Item 38, "Chain Link Fencing", measured along the fence line between the end posts, width of gates shall not be included. Payment for furnishing and installing each set of gates, complete with signs, will be made at the contract unit price each for Item 39 "Gates - 12 feet, Chain Link". The contract prices shall include all costs in connection with earth and rock excavation, concrete foundations, and grouting sockets.

14-03. LOG BOOM. - a. General. - The contractor shall furnish, construct, and erect a log boom at the location upstream of the dam as indicated on the drawings.

b. Materials. - (1) Boom logs shall be white pine or spruce having a minimum diameter of 10 inches at the tip and shall be furnished in 18-foot to 20-foot lengths except the maximum length shall be reduced as required to follow final finish grade and existing contours, and to avoid abrupt changes. Logs shall be sound, straight, free from rot, shall be clean peeled, and shall be approved prior to use. To the extent such logs are available, the contractor shall use logs obtained in the course of clearing operations. Clean peeling of logs shall conform to the requirements of Paragraph 6.8.4 of Federal Specification MM-P-371a.

(2) Steel piles shall be structural steel beams and conform to ASTM A 36-62T.

(3) Boom and auxiliary cable shall be new 3/4-inch galvanized wire rope, 3-strand, 7 wires to the strand, conforming to the requirements of Federal Specification RR-W-420, preformed.

(4) Boom chains shall conform to Federal Specification RR-C-271a, Type I, grade C, class 4, welded steel, proof coil chain, 1/2-inch size and approximately 5-1/2 feet long, overall. The rings and toggles shall meet the same specifications as for the boom chains. Chain, rings, and toggles shall be galvanized.

c. Construction. - A hole approximately 2-1/4 inches in diameter shall be bored through each end of the log. The logs shall be connected end to end by passing the boom chains through the bored holes and the whole assembly reinforced by threading the 3/4-inch wire rope through the rings of the boom chains. The ends of the cable shall be anchored to the steel

piles as shown on the drawings. Piles shall be driven to required depth in an approved manner. Exposed portions of piles shall be painted as hereinafter specified for trash rack structure.

d. Payment. - Payment for the log boom complete as specified will be made at the contract lump sum price for Item 40, "Log Boom", and shall include all costs in connection therewith including all metallic items, mastic coating, end anchorages, and galvanizing.

14-04. STAFF GAGES. - a. General. - The staff gages shall be installed at the locations indicated on the drawings and in accordance with the design and dimensions shown on the drawings. All excavation and backfill shall be performed and included under this paragraph.

b. Construction. - Staff gages shall be erected to the sizes and at locations indicated, except that the lengths of individual gage strips if not furnished in single section shall be provided with additional grommets on each side of the joint. The facing and back, including all edges, of each staff gage section shall be given an acid-resistant porcelain enamel finish over a 16-gage metal material of standard manufacture. A sample of the facing at least 2 feet long shall be submitted for approval before erection. The staff gages shall be set in concrete as directed. No concrete shall be set under posts. Concrete shall conform to applicable requirements of Section, CONCRETE. Posts shall be of S4S No. 1 structural long leaf yellow pine conforming to the grading rules of the Southern Pine Association. Posts shall be given a pressure preservative treatment using a creosote-coal-tar solution conforming to Federal Specification TT-C-650b, Class I or II. Preservative treatment process shall conform to Federal Specification TT-W-571g. Other materials shall be as shown on the drawings or as required.

c. Payment. - Payment for all work in connection with furnishing and installing staff gages will be made at the contract lump sum price for Item No. 41, "Staff Gages", which price shall include preservative treatment, posts, excavation and backfill, concrete and cement.

14-05. MISCELLANEOUS METAL ITEMS-INTAKE AND OUTLET STRUCTURES. - a. General. - This paragraph covers all metal work at the intake and outlet structures, except items specifically specified elsewhere, and includes pipe railing at inlet and outlet structures and trash racks and supports. Shop drawings shall be submitted for trash racks as required.

b. Pipe Railing. - Pipe rails shall be steel pipe conforming to Federal Specification WW-P-406b, weight A, Class 1, except that bend sections shall conform to Federal Specification WW-P-404c. Fabrication and anchorage shall conform to Paragraph 13-07.

c. Structural Steel. - Structural steel shall conform to ASTM Standard A36-62T.

d. Hollow Structural Tubing. - Hollow structural tubing shall be fabricated of structural steel conforming to ASTM Standard A 36-62T. Wall thickness shall be 1/4 inch.

e. Metal Fasteners. - Metal fasteners and bolts shall be provided hereunder where necessary and as required for completion of the work.

f. Installation. - The work shall be installed in a first class workmanlike manner. Plates and parts or devices necessary for proper installation, whether or not fully detailed on the drawings, shall be furnished and placed by the contractor. Welding shall conform to the American Welding Society Standard Code D1.0.

g. Painting. - The metal items for the intake structure shall be painted as specified in Paragraph 14-06 below. Painting of pipe railing at outlet structures shall conform to Paragraph 13-12 b.

h. Payment. - Payment for all work specified in the paragraph and all costs in connection therewith, including painting, as specified in Paragraph 14-06, will be made at the contract lump sum price for Item No. 37, "Miscellaneous Metal Items - Intake and Outlet Structures."

14-06. EPOXY COATING - FIELD APPLIED. - a. General. - Epoxy resin material, Type I or II as applicable, shall conform to Federal Specification MMM-G-00650 (ARMY CE) "Grout (Adhesive), Epoxy Resin Base, Flexible, Filled", and shall be field applied to the miscellaneous metal items of the intake structure as specified in Paragraph 14-05g.

b. Surface Preparation. - Surface upon which epoxy resin is to be applied shall be cleaned to bare metal by dry sandblasting with approved equipment and methods followed by air cleaning with filtered air. The application of epoxy resin shall be accomplished immediately following cleaning.

c. Application of Epoxy Resin Binder. - The epoxy resin binder material shall be applied when the ambient temperature is at or above 60° F. and the relative humidity is less than 70 percent. This environment shall be artificially created if necessary. The epoxy resin shall be mixed and applied in accordance with the manufacturer's recommendations. The epoxy shall be applied on a clean, essentially free of dust, warm, and dry metal surface so that it will completely cover the surface with a 15 mil thickness. The epoxy resin shall be cured to attain set hardness and a temperature and humidity environment shall be maintained until the epoxy resin has hardened.

d. Payment. - No separate payment will be made for the work specified in Paragraph 14-06 and all costs in connection therewith shall be included in the lump sum contract price for Item 37, "Miscellaneous Metal Items - Intake and Outlet Structures".

14-07. HIGHWAY GUARD RAIL. - Highway cable guard rail shall be installed where and as indicated on the drawings.

a. Highway Cable Guard Rail. - Highway cable guard rail shall be 2-cable type guard rail (type C-2-C) with concrete posts conforming to the requirements of the Massachusetts Standard Specifications, Section E-2, and the Massachusetts Construction Standards (see Paragraph SC-60), except as otherwise specified or indicated on the drawings.

b. Measurement and Payment. - Guard rail will be measured for payment by the linear foot of cable guard rail satisfactorily installed between centerlines of end posts. Payment will be made at the contract unit price for Item 42, "Cable Guard Railing", which price shall include all costs in connection with constructing the guard rail complete, including end and intermediate anchorages, dummy posts, and painting.

14-08. BUMPER GUARD. - a. General. - Bumper guard shall be furnished and installed at the parking area where indicated on the drawings. Hardware shall be galvanized commercial stock supply.

b. Materials. - (1) Wood Posts. - The posts shall be of seasoned white oak, cedar, locust or tamarack, sound and cut from live timber. Rectangular posts shall be eight inches by six inches and six (6) feet long. Round posts may be used at contractor's option and shall be eight inches in diameter and six feet in length. They shall be shaved to even surface and free from bark or skin.

(2) Rails. - The plank for horizontal rails shall be seasoned spruce or other approved wood, planed on four sides, of the dimensions indicated on the drawings.

(3) Preservative Treatment. - Posts and rails shall be pressure-preservative treated with oil-borne preservative in a closed retort in conformance with Federal Specification TT-W-571g & Am-1, to a minimum net retention of preservative of 6 pounds per cubic foot. Treated materials, cut or bored after treatment, shall have cut and bored surfaces well brush coated with preservative used in the treatment. Wood shall be clean and free from surface oil prior to treatment.

c. Installation. - The guard rail shall be constructed in accordance with the drawings, with the posts set vertically and accurately aligned. The post holes shall be backfilled with suitable material,

thoroughly tamped in layers of not more than six inches. The plank rail shall be properly secured to the posts with carriage bolts as indicated on the drawings. Joints in rails shall occur at posts.

d. Painting. - Posts and rails shall receive two coats of paint allowing a minimum of three days of clear weather between coats. Black paint (Federal Specification TT-P-61, Type B) shall be used from ground line to bottom of rail. White paint (Federal Specification TT-P-102) shall be used for painting rails and remainder of posts.

e. Payment. - Payment for furnishing and installing bumper guard will be made at the contract unit price per linear foot for Item 43, "Bumper Guard", measured along the guard rail from center of end post to center of end post. The contract price shall include all costs in connection with earth and rock excavation, backfill, painting, and concrete grout.

14-09. EXISTING FENCES - REMOVED AND RESET. - a. General. - Wherever indicated on the drawings or directed by the Contracting Officer, the present fencing, including gates, located in areas to be graded shall be removed and reset in new locations. As required, temporary fencing shall be installed prior to relocation of existing fencing to provide maximum protecting and enclosure of cattle, horses, chickens, etc.; if necessary, the contractor shall provide new fencing and gates to match existing as to height and type if it is not feasible to relocate existing.

b. Payment. - No separate payment will be made for the work specified in this paragraph and all costs in connection therewith shall be included in the contract lump sum price for Item 1, "Preparation of Site".

14-10. MAIL BOXES, SIGNS, ETC., REMOVED AND RESET. - a. General. - Wherever indicated on the drawings or directed by the Contracting Officer, the present street signs, rural mail boxes, paper boxes, signs, etc., located in areas to be graded, or in areas inaccessible after construction of new work shall be removed and reset in new locations.

b. Installation. - If necessary during construction, mail boxes shall be set in temporary locations, as directed, so that they are satisfactorily available to the mail carrier.

c. Payment. - No separate payment will be made for the work required under this paragraph and all costs in connection therewith including excavation and backfill shall be included in the applicable contract price for Item 1, "Preparation of Site".

14-11. CONCRETE BOUNDS. - Concrete bounds shall be furnished and set at locations shown on the drawings or where directed by the Contracting Officer. Concrete bounds shall be furnished and set in accordance with the applicable provisions of Section G-8 of the Massachusetts Standard Specifications. The bounds shall be constructed to the standards established by the Hampden County Engineer. Each bound shall be measured as a single item. Payment will be made at the contract unit price each for Item 51, "Concrete Bounds", which price will include full compensation for furnishing and setting the bonds complete as specified in Section G-8.

SECTION 15

BITUMINOUS CONCRETE PAVEMENTS
(Items 45, 45A, and 47)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
15-01	Scope	15-1
15-02	Description	15-1
15-03	Prime Coat	15-1
15-04	Bituminous Concrete Pavement	15-1
	a. Pavement Thickness	15-1
	b. n Job Mix Formulas	15-1
	c. Junctions of New and Existing Pavement	15-1
15-05	Bituminous Concrete Berms	15-1
15-06	Payment	15-2
	a. Bituminous Concrete Pavements	15-2
	b. Bituminous Concrete Berms	15-2

SECTION 15

BITUMINOUS CONCRETE PAVEMENTS
(Items 45, 45A, and 47)

15-01. SCOPE. - This section covers the construction of hot-mix bituminous concrete pavement including the application of a bituminous prime coat on a previously prepared gravel base course, and construction of bituminous concrete berms, complete. Paved ditches are specified and included under Section 12.

15-02. DESCRIPTION. - The 2-1/2-inch pavements shall be constructed on the primed base in two courses consisting of a 1-1/4-inch binder base course and a 1-1/4-inch surface (top) course. The 2-inch pavements shall be constructed on the primed base in a single surface (top) course. Berms shall be of shape and size shown on drawings.

15-03. PRIME COAT. - Prime coat shall be applied on the gravel base course in accordance with the requirements of Section 16, "BITUMINOUS PRIME COATS AND SURFACE TREATMENTS".

15-04. BITUMINOUS CONCRETE PAVEMENT. - The binder and surface courses shall conform to Section B-18, Class I Bituminous Concrete Pavement, Type I-1, standard binder and top courses, respectively, of the Massachusetts Standard Specifications, as revised April 1962, and as hereinafter specified.

a. Pavement Thickness. - Pavement thickness shall be as indicated on the drawings.

b. Job Mix Formulas. - The contractor shall submit for approval, not less than 15 days prior to contemplated use, proposed job mix formulas conforming to the requirements of the above-noted specifications with the added provision that the gradation and batch weight of each hot bin utilized in developing the job mix formula shall be furnished.

c. Junctions of New and Existing Pavement. - New pavement shall meet existing pavements at locations shown. The junction shall be neatly made to the approval of the Contracting Officer.

15-05. BITUMINOUS CONCRETE BERMS. - Bituminous concrete berms shall be constructed using dense mix material and shall be of the shape and size shown on the drawings and shall conform to the relevant requirements of Section B-18, of the Massachusetts Standard Specifications. The mixture shall be placed and compacted with a machine acceptable and approved by the Contracting Officer for dense mix.

15-06. PAYMENT. - a. Bituminous Concrete Pavements. - Measurement for the pavements will be by the square yard. Payment will be made at the applicable contract unit prices for Item 45, "Bituminous Concrete Pavement, 2-inch" and Item 45A, "Bituminous Concrete Pavement, 2-1/2-inch", which prices shall constitute full compensation for all work involved including preparing and/or conditioning the base course and the prime coat.

b. Bituminous Concrete Berms. - Measurement will be by the linear foot of berm acceptably placed. Payment will be made at the contract unit price for Item 47, "Bituminous Concrete Berms", which price shall include all costs in connection with furnishing and placing the berms.

SECTION 16

BITUMINOUS PRIME COATS AND SURFACE TREATMENTS (Item 46)

INDEX

Paragraph No.	Paragraph Title	Page No.
16-01	Scope	16-1
16-02	Description	16-1
	a. Bituminous Surface Treated Roads and Shoulders	16-1
	b. Bituminous Concrete Surfaced Roads	16-1
16-03	Applicable Publications	16-1
	a. Federal Specification	16-1
	b. American Society for Testing and Materials Standards	16-1
	c. American Association of State Highway Officials Standard	16-1
16-04	Materials	16-2
	a. Mineral Aggregate	16-2
	b. Gradation of Aggregates	16-2
	c. Bituminous Materials	16-2
16-05	Sampling and Testing	16-3
	a. Samples	16-3
	b. Tests	16-3
16-06	Quantities of Materials Per Square Yard	16-3
16-07	Equipment, Tools, and Machines	16-4
	a. Bituminous Distributors	16-4
	b. Heating Equipment for Storage Tanks	16-4
	c. Power Rollers	16-4
	d. Mechanical Spreaders	16-5
	e. Broom Drags	16-5
	f. Brooms and Blowers	16-5
16-08	Weather Limitations	16-5

Paragraph No.	Paragraph Title	Page No.
16-09	Conditioning Base Courses and Shoulders	16-5
16-10	Preparation of Surface	16-5
16-11	Application of Prime Coat	16-6
16-12	First Application of Bituminous Material	16-6
16-13	First Spreading of Aggregate	16-7
16-14	Brooming and Rolling First Course	16-7
16-15	Second Application of Bituminous Material	16-8
16-16	Second Spreading of Aggregate	16-8
16-17	Brooming and Rolling Second Course	16-8
16-18	Waybills and Delivery Tickets	16-8
16-19	Measurement	16-8
16-20	Payment	16-9

SECTION 16

BITUMINOUS PRIME COATS AND SURFACE TREATMENTS (Item 46)

16-01. SCOPE. - This section covers bituminous surface treatments, complete, including prime coats for bituminous surface treated roads and shoulders. In addition, this section covers prime coat for bituminous concrete surfaced roads.

16-02. DESCRIPTION. - a. Bituminous Surface Treated Roads and Shoulders. - The roadway surfaces shall receive a prime coat and a double bituminous surface treatment as hereinafter specified. Where berms are not required, shoulder areas shall not receive a prime coat or bituminous surface treatment. Shoulder areas adjacent to berms however, shall receive a prime coat and a double bituminous surface treatment as applied to roadway surfaces. Surface treatment of the shoulders shall be accomplished after construction of the bituminous concrete berms.

b. Bituminous Concrete Surfaced Roads. - The base courses for all bituminous concrete pavements shall receive a prime coat prior to placing the bituminous concrete.

16-03. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

a. Federal Specification. -

SS-A-671a & Am-1	Asphalt; Cut-Back (for) Road-Work.

b. American Society for Testing and Materials Standards. -

C 131-55	Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine.
C 136-63	Test for Sieve or Screen Analysis of fine and Coarse Aggregates.
D 75-59	Sampling Stone, Slag, Gravel, Sand, and Stone Block for Use as Highway Materials.
D 140-55	Sampling Bituminous Materials.

c. American Association of State Highway Officials Standard. -

T 102-57	Spot Test of Asphaltic Materials.

16-04. MATERIALS. - The materials used in the application of the prime coat and the bituminous surface treatments shall be mineral aggregate and the bituminous material, of the following types, gradations, grades, and consistencies, and shall meet the requirements of stripping and wear tests as specified.

a. Mineral Aggregate. - Mineral aggregate shall consist of crushed stone or crushed gravel, free from adherent films of clay, and shall be of such nature that a thorough coating of the bituminous material used in the work will not strip off upon contact with water. The moisture content of the aggregate shall not be sufficient to prevent it from being readily coated with the bituminous material. Drying may be required as directed.

(1) Crushed stone shall consist of clean, sound, durable fragments of stone, free from an excess of flat, elongated, soft, or disintegrated pieces and dust, and shall be free from dirt, or other objectionable matter.

(2) Crushed gravel shall consist of clean, sound, durable pieces, free from an excess of soft or disintegrated particles and dust, and shall be free from dirt or other objectionable matter. At least 90 percent by weight of the particles shall consist of at least two fractured faces.

b. Gradation of Aggregates. - The crushed stone or crushed gravel shall conform to the grading shown in table I. The gradation of the aggregates shall be determined by ASTM Standard C 136.

TABLE I

	Percentage by Weight Passing Square Mesh Sieves Gradation Designations	
Sieve Designation	No. 1	No. 2
3/4"	100	--
1/2"	90-100	--
3/8"	40-70	100
No. 4	0-15	85-100
No. 8	0-5	10-40
No. 16	---	0-10

c. Bituminous Materials. - Bituminous materials used for the prime coat and the bituminous surface treatment shall conform to the following:

(1) Rapid-curing cutback asphalt for bituminous surface treatments shall conform to the requirements of Federal Specification SS-A-671, grade RC-4 or RC-5. In addition to the requirements of the Federal Specification, the residue from distillation to 680 degrees F. shall show a negative spot when tested in accordance with AASHO Standard T102, using the standard naptha specified therein.

(2) Medium curing cutback asphalt for prime coat shall conform to the requirements of Federal Specification SS-A-671, grade MC-0 or MC-1. In addition to the requirements of the Federal Specification, the residue from distillation to 680 degrees F. shall show a negative spot when tested in accordance with AASHO Standard T102, using the standard naptha specified therein.

16-05. SAMPLING AND TESTING. - a. Samples. - Samples shall be furnished by the contractor at no expense to the Government. Sampling shall be in accordance with ASTM Standard D75 for aggregates and ASTM Standard D 140 for bituminous material, unless otherwise directed. Suitably sized samples of aggregates and bituminous materials shall be submitted to the Contracting Officer for approval not less than 15 days before starting the work. Additional samples of materials shall be furnished by the contractor during construction, as required. Sampling of materials will be observed and supervised by the Contracting Officer when deemed necessary.

b. Tests. - Tests will be performed by the Government at no cost to the contractor.

(1) Stripping Test. - A test sample consisting of the aggregate and bitumen to be used in the surface treatment will be mixed at the temperature specified herein. The sample will then be spread in a loose, thin layer and allowed to air-season for 24 hours before testing. A portion of the sample not over one-half the capacity of the jar, will be placed in a glass jar and completely covered with distilled water. The jar will be fitted with a tight screw cap and allowed to stand for a period of 25 hours. The jar will be vigorously shaken for a period of 15 minutes, and the sample of the mixture will then be examined for stripping. If stripping occurs, the aggregate will be rejected, or an approved method of treating the bituminous materials will be used to prevent it. No method will be used that is of such nature as to cause bituminous material to fail to meet the specifications.

(2) Wear Test. - All aggregates will have a percentage of wear not exceeding 40 percent after 500 revolutions, as determined in accordance with ASTM Standard C 131.

16-06. QUANTITIES OF MATERIALS PER SQUARE YARD. - a. Bituminous material for the prime coat shall be applied at the approximate rate of 0.40 gallon per square yard of shoulder surface or base course, as applicable. The exact quantity may be varied to suit field conditions.

b. The bituminous material and aggregate for the bituminous surface treatments shall be spread in the quantities as shown in Table II. The individual quantities of bituminous material and aggregate may be varied to meet specific field conditions at any time during progress of the work, as directed, without adjustments to contract price.

TABLE II

Grading	Bituminous material, gallons per square yard, first application	Aggregate pounds per square yard, first spreading	Bituminous material, gallons per square yard, second application	Aggregate, pounds per square yard, second spreading
No. 1	0.25-0.35	35-45	---	---
No. 2	--	--	0.20-0.30	15-25

16-07. EQUIPMENT, TOOLS, AND MACHINES. - Equipment, tools, and machines used in the performance of the work shall be subject to approval and shall be maintained in a satisfactory working condition at all times.

a. Bituminous Distributors. - Bituminous distributors shall have pneumatic tires of such width and number that the load produced on the base surface will not exceed 650 pounds per inch of tire width. The distributor shall be designed and equipped to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates ranging from 0.50 to 2.0 gallons per square yard, with a pressure range of from 25 to 75 pounds per square inch. The allowable variation from any specified rate shall not exceed 5 percent. The distributor equipment shall include a separate power unit for the bitumen pump, full-circulation spray bars, tachometer, pressure gages, volume-measuring devices, a thermometer for reading the temperature of tank contents, and a hose attachment suitable for applying bituminous material to inaccessible areas and patches. The distributor shall be equipped for circulation and agitation of the bituminous material during the heating process.

b. Heating Equipment for Storage Tanks. - Heating equipment for storage tanks shall consist of steam coils and equipment for producing steam, so designed that steam will not be introduced into the material. An armored thermometer with a range from 100 degrees F. to 400 degrees F. shall be affixed to the tank so that the temperature of the bituminous material may be determined at all times.

c. Power Rollers. - Power rollers shall be steel-wheel or pneumatic-tired type conforming to the following requirements:

(1) Steel-wheel rollers shall be of either tandem or three-wheel construction weighing not less than 5 tons and shall be suitable for rolling bituminous pavements. The wheels of the rollers shall be equipped with adjustable scrapers. The rollers shall be equipped with water tanks and sprinkling apparatus to be used when necessary to keep the wheels wet to prevent adherence of the bituminous material to the wheels.

(2) Pneumatic-tired rollers shall be self-propelled and equipped with not less than nine wheels mounted on two axles in such manner that the rear tires will not follow in the tracks of the forward group. The pneumatic-tired roller shall also be equipped with suitable boxes or platforms for ballast loading and shall be loaded as directed. The tires shall be uniformly inflated to not less than 45 pounds per square inch pressure.

d. Mechanical Spreaders. - Mechanical spreaders shall be adjustable and capable of spreading aggregate at controlled amounts per square yard as specified.

e. Broom Drags. - Broom drags shall consist of brooms of an approved type, mounted in a frame and in such a manner as to spread the aggregate uniformly over the surface of the area to be treated. The drags shall be equipped with tow plates for towing. Towing equipment shall be pneumatic-tired.

f. Brooms and Blowers. - Brooms and blowers shall be of the power type, suitable for effectively cleaning the surfaces to be treated.

16-08. WEATHER LIMITATIONS. - The prime coat and the bituminous surface treatments shall be applied only when the gravel shoulders or base course or primed gravel base course or shoulders, as applicable, is dry or contains moisture not in excess of that which will permit uniform distribution and the desired penetration. It shall not be applied when the atmospheric temperature in the shade is below 50 degrees F., unless otherwise directed.

16-09. CONDITIONING BASE COURSES AND SHOULDERS. - The surfaces of the base courses and shoulders will be inspected and tested for tolerances by the Contracting Officer. Any deviation in excess of the required tolerances shall be corrected as directed. Any ruts or soft, yielding spots that may appear in the base course or shoulder shall be corrected by loosening, removing unsuitable material, adding suitable material, reshaping, and recompacting to line and grade, as directed.

16-10. PREPARATION OF SURFACE. - Immediately before applying the prime coat and the first application of bituminous material for surface treatment, the base course or shoulder surface course or primed surface,

as applicable, shall be cleaned of loose material with power sweepers, power blowers, or hand brooms, as directed. Care shall be taken to remove all dirt, clay, and other loose or foreign matter. After the cleaning operation has been completed, and prior to the prime coat and the first application of bituminous material for surface treatment, the area to be treated will be inspected by the Contracting Officer to determine its fitness for receiving the prime coat and the first application of bituminous material.

16-11. APPLICATION OF PRIME COAT. - Immediately following the preparation of the gravel base course or shoulder, as applicable, the bituminous prime coat material shall be applied by means of a bituminous distributor at the temperature designated by the Contracting Officer, within the range of 50 to 120 degrees F. for MC-0 and 80 to 125 degrees F. for MC-1. The bituminous material shall be applied at the pressure and in the amounts as directed by the Contracting Officer. The priming material shall be so applied that uniform distribution is obtained at all points of the surface to be primed. Unless the distributor is equipped so as to obtain satisfactory results at the junction of the previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application so that flow through the sprays may be started and stopped on the paper, and that all sprays will be operating at full force on the surface to be treated. Immediately after the application, the building paper shall be removed and destroyed. All spots unavoidably missed by the distributor shall be properly treated with bituminous material. Following the application of prime material, the surface shall be allowed to dry for a period of not less than 48 hours without being disturbed, or for such additional period of time as may be necessary to attain penetration into the foundation course and drying out or evaporation of the volatiles from the prime material, which period shall be determined by the Contracting Officer. The contractor shall furnish and spread sufficient approved sand on all areas which show an excess of bituminous material to effectively blot up and cure the excess as directed. The primed surface shall be maintained by the contractor until the first application of surface treatment or binder course is placed. During the interval, the contractor shall protect the primed surface against damage and shall repair all broken spots. No smoking, fires or flames other than the heaters that are a part of the equipment shall be permitted within 25 feet of heating, distributing or transferring operations of bituminous materials.

16-12. FIRST APPLICATION OF BITUMINOUS MATERIAL. - First application of bituminous material for surface treatment shall be applied by means of a bituminous distributor at the temperature designated by the Contracting Officer, within the range of 180 to 225 degrees F. for RC-4 and 215-285 degrees F. for RC-5. The bituminous material shall be applied in the amounts within the limits specified in Paragraph: QUANTITIES OF

MATERIAL PER SQUARE YARD, as determined by the Contracting Officer. The bituminous material shall be so applied that uniform distribution is obtained over all points of the surface to be treated. Unless the distributor is equipped to obtain satisfactory results at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application so that flow through the sprays may be started and stopped on the paper in order that all sprays will be operating at full force on the surface to be treated. Immediately after the application, the building paper shall be removed and destroyed. All areas inaccessible to the distributor shall be properly treated with bituminous material. No smoking, fires, or flames other than the heaters that are a part of the equipment shall be permitted within 25 feet of heating, distributing, or transferring operations of bituminous materials other than bituminous emulsions. If tar is used, a full-face, organic, vapor-type respirator and protective creams shall be used by personnel exposed to fumes. Protective creams shall not be used as a substitute for cover clothing.

16-13. FIRST SPREADING OF AGGREGATE. - Immediately following the first application of bituminous material for surface treatment, the coarser aggregate shall be spread uniformly over the surface in amounts within the limits specified in paragraph: QUANTITIES OF MATERIAL PER SQUARE YARD. Spreading shall be done with mechanical spreaders. The aggregate shall be spread evenly by hand on all areas missed by the mechanical spreader. Equipment spreading aggregate shall be operated backwards so that the bituminous material will be covered ahead of the truck wheels. When hand spreading is employed on inaccessible areas, aggregate shall be spread directly from trucks. Additional aggregate over areas having insufficient cover shall be spread by hand and shall be continued during the operations whenever necessary.

16-14. BROOMING AND ROLLING FIRST COURSE. - The surface shall be rolled after sufficient aggregate is spread, and rolling shall continue until no more aggregate can be worked into the treated surface. The rolling of the course shall be accompanied by the use of a self-propelled pneumatic-tired roller or a tandem or three-wheel power roller. If rolling the course with a tandem or a three-wheel power roller excessively crushes and shatters the aggregate, the roller shall be removed from the course, and any additional rolling required shall be accomplished with a self-propelled pneumatic-tired roller as directed. The surface shall be broom dragged as soon as possible after the first coverage by the roller, but not until the surface has set sufficiently to prevent excessive marking. Broom dragging shall continue until the aggregate is uniformly distributed over the surface. Broom dragging, rolling, and supplemental spreading of aggregate shall continue until the surface is cured and rolled sufficiently to key and set the aggregate, as approved. In all places not accessible to the rollers, the aggregate shall be adequately compacted with pneumatic tampers. Any aggregate that becomes coated or

or mixed with dirt or any other foreign matter shall be removed, replaced with clean aggregate, and rerolled, as directed. All surplus aggregate shall be swept off the surface and removed prior to the second application of bituminous material. The contractor shall maintain and protect the treated areas by barricades, if so directed, until the second application of bituminous material is applied.

16-15. SECOND APPLICATION OF BITUMINOUS MATERIAL. -Second application of bituminous material shall follow within 24 hours after the construction of the first course, weather permitting, unless the treated surface is excessively moistened by rain, when it shall be allowed to dry, for such time as is deemed necessary by the Contracting Officer. The second application of bituminous material shall be applied in the manner including the safety precautions specified in paragraph: FIRST APPLICATION OF BITUMINOUS MATERIAL at the temperature as directed by the Contracting Officer, within the range of 180 to 255 degrees F. for RC-4 and 215-285 degrees F. for RC-5. The bituminous material shall be applied in the amounts within the limits specified in paragraph FIRST APPLICATION OF BITUMINOUS MATERIAL at the temperature as directed by the Contracting Officer, within the range of 180 to 255 degrees F. for RC-4 and 215-285 degrees F. for RC-5. The bituminous material shall be applied in the amounts within the limits specified in paragraph: QUANTITIES OF MATERIALS PER SQUARE YARD, as directed.

16-16. SECOND SPREADING OF AGGREGATE. - Immediately following the second application of bitumen, the finer mineral aggregate conforming to the grading specified in Paragraph: MATERIALS, shall be spread uniformly over the bituminous material in the amounts within the limits specified in paragraph: QUANTITIES OF MATERIAL PER SQUARE YARD, as directed. The aggregate shall be spread and processed in the manner specified for the first course.

16-17. BROOMING AND ROLLING SECOND COURSE. - The surface shall be rolled and broom dragged in the manner specified for the first course until a thoroughly bonded, smooth, even textured surface is produced. All surplus aggregate shall be swept off the surface and removed prior to final acceptance.

16-18. WAYBILLS AND DELIVERY TICKETS. - Copies of waybills and delivery tickets shall be submitted during the progress of the work. Before the final statement is allowed, the contractor shall file with the Contracting Officer certified waybills and delivery tickets for all the bituminous materials used in the prime coat and the bituminous surface treatments. The contractor shall not remove bituminous materials from the tank cars or storage tanks until the initial outage and temperature measurements have been taken by the Contracting Officer, nor shall the cars or tanks be released until the final outages have been taken by the Contracting Officer.

16-19. MEASUREMENT. - The quantity of double bituminous surface treatment to be paid for will be the number of square yards of surface acceptably treated in accordance with the requirements hereinbefore

specified and within the limits indicated on the drawings. No measurement or separate payment will be made for prime coat.

16-20. PAYMENT. - Payment for the double bituminous surface treatment will be made at the contract unit price per square yard for Item 46, "Bituminous Surface Treatment", which price shall include all costs in connection with furnishing and placing all materials including prime coat required under this section of the specifications. All costs for furnishing and placing bituminous prime coat in areas to receive bituminous concrete pavement shall be included in the applicable contract unit prices for Items, "Bituminous Concrete Pavement".

SECTION 17

TOPSOILING, SEEDING, AND MULCHING
(Items 49, 50, and 53)

INDEX

Paragraph No.	Paragraph Title	Page No.
17-01	Scope	17-1
17-02	Definitions	17-1
	a. Topsoil	17-1
	b. Depth of Topsoil Salvage	17-1
	c. Segregation of Topsoil Types	17-1
	d. Class A Seedbed	17-1
	e. Class B Seedbed	17-1
17-03	Treatment of Areas to be Topsoiled and/or seeded	17-1
17-04	Materials	17-3
	a. Topsoil	17-3
	b. Fertilizer	17-3
	c. Lime	17-3
	d. Seed	17-4
	e. Mulch	17-5
	f. Jute Erosion Control Matting	17-5
17-05	Inspection and Tests	17-5
	a. Topsoil	17-5
	b. Fertilizer and Lime	17-6
	c. Seed	17-6
	d. Mulch	17-6
	e. Jute Erosion-Control Matting	17-6
	f. Nomenclature	17-7
17-06	Preparation of Subgrade	17-7
	a. General	17-7
	b. Clearing of Subgrade	17-7
	c. Grading of Subgrade	17-7
	d. Tillage of Subgrade	17-7
	e. Approval of Subgrade	17-7

Paragraph No.	Paragraph Title	Page No.
17-07	Obtaining Topsoil	17-8
17-08	Placing Topsoil	17-8
17-09	Preparation of Seedbed	17-8
	a. General	17-8
	b. Fine Grading	17-9
	c. Application of Fertilizer and Lime	17-9
	d. Leveling	17-9
17-10	Planting Seed	17-9
	a. General	17-9
	b. Rates	17-10
	c. Broadcast Seeding	17-10
	d. Drill Seeding	17-10
	e. Floss Spraying	17-10
17-11	Compacting	17-11
17-12	Applying Mulch	17-11
17-13	Securing Mulch	17-11
17-14	Removal of Mulch	17-12
17-14A	Installation of Jute Erosion Control Matting	17-12
	a. Area Where Matting is Required	17-12
	b. Soil Preparation	17-12
	c. Placing Jute Matting	17-12
	d. Maintenance and Repair	17-13
17-15	Protection	17-13
17-16	Clean-Up	17-13
17-17	Establishment	17-13
	a. General	17-13
	b. Watering	17-13
	c. Mowing	17-14
	d. Refertilizing and Reseeding	17-14
	e. Herbicide Application	17-14

Paragraph No.	Paragraph Title	Page No.
17-18	Repair	17-14
17-19	Cover Seeding	17-14
17-20	Measurement	17-14
	a. Topsoiling	17-14
	b. Seeding	17-15
	c. Jute Erosion Control Matting	17-15

SECTION 17

TOPSOILING, SEEDING, AND MULCHING
(Items 49, 50, and 53)

17-01. SCOPE. - This section covers topsoiling, seeding, mulching, and maintenance and establishment of grass.

17-02. DEFINITIONS. - a. Topsoil. - Earth material consisting of the upper layer or layers of productive soil and humus shall be salvaged for reuse as a medium for the production of grass cover. Such earth material is defined as topsoil. Peat, muck, and silt, excavated from swamp and bog areas shall not be considered topsoil and shall be salvaged and reused for topsoiling purposes only when and as directed by the Contracting Officer.

b. Depth of Topsoil Salvage. - The contractor shall strip salvage and stockpile topsoil for reuse in topsoiling, in a manner and to a depth which shall insure conservation and reuse of the best topsoil available from areas to be graded and excavated. Incorporation of underlying material undesirable for use in topsoiling shall be avoided. Stripping for structural purposes shall be accomplished to depths and as required by other sections of these specifications.

c. Segregation of Topsoil Types. - Topsoil shall be segregated from all other earth or rock materials, but segregation of topsoil of different types or from different areas shall not be required. However, topsoil used in construction and repair of lawn areas where lawn seed as defined in this section of the specifications is used, shall be selected from the best topsoil available in the stockpiles.

d. Class A Seedbed. - A Class A seedbed is a seedbed constructed by properly preparing the subgrade as required by Paragraph PREPARATION OF SUBGRADE of this section of the specifications, applying topsoil to the depth indicated on the drawings, or if not so indicated, to a depth of not less than four (4) inches, and grading to required limits.

e. Class B Seedbed. - A Class B seedbed is a seedbed constructed by properly preparing, in accordance with paragraph PREPARATION OF SEEDBED of this section of the specifications, the soil surface in place after other operations have been completed. No topsoiling is required unless topsoiling is a part of another operation, or unless the area is used for disposal of excess topsoil.

17-03. TREATMENT OF AREAS TO BE TOPSOILED AND/OR SEEDED. - a. The following areas shall be topsoiled (Class A Seedbed) and seeded, using Class A seed:

(1) Areas as indicated on the drawings to be topsoiled and seeded, except where treatment falls under Subparagraph b below.

(2) Areas not indicated on the drawings but which fall within the meaning of GC-9. These areas shall be treated at no additional cost to the Government.

(3) Areas disturbed by the contractor including areas falling outside the limit of work line, areas within the limit of work line where no work is indicated on the drawings, and areas used for the convenience of the contractor including haul roads, storage areas, access roads, field office sites, parking areas, stockpile areas and areas of similar use, unless specifically exempted in writing by the Contracting Officer. These areas shall be treated at no additional cost to the Government.

(4) The provisions of Subparagraphs 17-03a(1), (2), and (3), above, do not exempt the contractor from responsibility for vegetation other than grass, such as trees and shrubs, in accordance with GC-9 of these specifications.

(5) Earth slopes and disturbed areas near or adjacent to the Spillway Approach Channel, the Spillway Discharge Channel, and the Outlet Channel of the dam Outlet Works.

(6) Earth Slopes and disturbed areas along the relocated, improved, raised and new roads, except that lawn areas shall be treated as specified in Paragraph 17-03b(1), of this section of the specifications. Areas inside the turnaround on waterworks road and the turnaround on East Hill Road are included.

(7) Earth slopes and disturbed areas on, near and adjacent to the Munn Road - Sutcliffe Road Dike.

(8) Earth slopes and disturbed areas near, adjacent to or contained in diversion ditches, drainageways, and similar drainage control facilities.

(9) Areas disturbed by the relocation of water line and the installation of underground drainage conduits, inlets, manholes, and similar facilities.

b. The following areas shall be topsoiled (Class A Seedbed) and seeded, using Class B (lawn) seed.

(1) Areas graded, excavated or disturbed by construction of the road relocation, road improvements or by road raising, which are

near or adjacent to existing houses, buildings, drives or walks and which prior to construction operations were lawn type areas or areas maintained as lawns.

c. Borrow areas shall be treated in accordance with the applicable provisions of the EXCAVATION section of the specifications, and shall be fertilized, spray seeded, mulched and maintained as required by this section of the specifications.

d. Spoil areas and waste areas shall be seeded using a Class B seedbed and Class A seed. The contractor shall be responsible for managing the spoil operation in such a manner that boulders, large stones, stumps, roots, trees and similar material shall be covered with earth material, and shall not remain exposed on the surface or side slopes of the spoil and waste areas. The contractor shall also be responsible for providing an earth cover over the surface and side slopes of spoil areas of at least 4 inches. Surplus topsoil may be used for this purpose, but only when all other requirements for topsoil have been fulfilled.

17-04. MATERIALS. - a. Topsoil. - Topsoil shall be salvaged from areas within the limit of work in which excavation or grading is required, and below elevation 693 upstream of the dam. All other topsoil necessary to complete the work shall be furnished by the contractor from approved sources off the site at no additional cost to the Government. Topsoil to be provided by the contractor shall be natural fertile friable surface soil possessing the characteristics of representative soils in the vicinity that produce heavy growths of crops, grass, or other vegetation and shall be obtained from naturally well-drained areas. The topsoil shall be reasonably free from subsoil, clay lumps, brush, objectionable weeds and other litter. The topsoil shall be free from objects larger than 2 inches in any dimension, including stones, stumps, roots and debris, and shall not contain toxic substances or any other material or substance which might be harmful to plant growth or be a hindrance to grading, planting or maintenance operations. Delivery of off-site topsoil shall not begin prior to written approval from the Contracting Officer.

b. Fertilizer. - Fertilizer shall be a complete, 10-6-4 grade, uniform in composition, free flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State Fertilizer laws, and bearing the name, trade name or trade mark, and warranty of the producer.

c. Lime. - Lime shall be ground limestone containing not less than 85 percent of total carbonates and shall be ground to such fineness that at least 50 percent will pass through a 100-mesh sieve and at least 90 percent will pass through a 20-mesh sieve. Coarser materials will be acceptable provided the specified rates of application are increased

proportionately, on the basis of quantities passing the 100-mesh sieve, but no additional payment will be made for the increased quantity.

d. Seed. - All seed used shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation for Bids. All seed shall be furnished in sealed standard containers, unless exception is granted in writing by the Contracting Officer. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The analysis of seed in each lot of mixture shall be as follows:

Kind of Seed (Botanical Name (Common Name)	% by Wt. In Mixture	Min. % Purity	Min. % Germ.
	CLASS A SEED (Erosion Control)		
Agrostis tenuis hv. Highland Bentgrass	5	98	85
Bromus inermis Smooth Brome	10	85	90
Festuca elatior arundinaceae Alta Fescue	30	98	85
Festuca rubra Red Fescue	35	98	85
Poa Compressa Canada Bluegrass	15	80	75
Trifolium repens White Clover (New York Wild Strain)	5	98	85
	CLASS B SEED (Lawn Seed)		
Agrostis tenuis hv. Highland Bentgrass	10	98	85
Festuca rubra Red Fescue	35	98	85
Festuca rubra commutata Chewings Fescue	35	98	85
Poa Pratensis Kentucky Bluegrass	15	80	75
Trifolium repens White Clover (New York Wild Strain)	5	98	85

NOTE: Weed Seed for both Class A and Class B not to exceed 1.0% of total mixture.

e. Mulch. - To be used on all seeded areas.

(1) General. - Acceptable mulch shall be any of the following materials, or other approved locally available material. Mulch material which contains an excessive quantity of mature seed of noxious weeds or other species which would grow and be detrimental to the desired turf, or provide a menace to surrounding farm land will not be acceptable. Straw or other mulch material that is fresh or excessively brittle, or that is in such an advanced stage of decomposition as to smother or retard growth of grass, will not be acceptable.

(a) Straw shall consist of the threshed stalks of oats, wheat, barley, rye, rice, flax, beans, peas or peanuts.

(b) Hay shall be cured, dried and shall be made up of native grasses, marsh or beach grasses or sedges.

f. Jute Erosion-Control Matting. - The matting shall be a cloth of a uniform open plain weave of undyed and unbleached single jute yarn. The yarn shall be of a loosely twisted construction and shall not vary in thickness by more than one-half its normal diameter. Jute matting shall be furnished in new and unused rolled strips as follows: 78 warp ends per width, 41 weft ends per yard. A tolerance of plus or minus 5 percent in weight is allowable. In addition, matting and staples shall be as follows:

(1) Minimum Width: 42 inches
Weight: 1.4 lbs. per sq. yard.

(2) Staples for the matting shall be made from No. 8 steel wire bent U-shaped. The U shall be 1-1/2 to 2 inches in width and the overall length of staple shall be 10 inches. This type staple is for use mainly in cohesive and stable soils.

17-05. INSPECTION AND TESTS. - a. Topsoil. - At least 30 days prior to the intended delivery of off-site topsoil, the contractor shall notify the Contracting Officer of the sources from which topsoil is to be furnished. The topsoil proposed for use will be inspected by the Contracting Officer to determine whether the selected soil or soils meet the requirements. At the time of inspection, the Contracting Officer will require representative soil samples to be taken from several locations on the area(s) under consideration, to be tested for physical properties and pH (or lime requirements), for organic matter, and for available nitrogen, phosphoric acid and potash. Samples shall be supplied by the contractor at no additional cost to the Government, and tests will be made under the supervision of the Contracting Officer without cost to the contractor. Sampling and testing will be in accordance with standard practices of soil testing. Topsoil shall be approved prior to use. Topsoil from off-site sources shall be required to contain not less than 5% nor more than

20% organic matter as determined by loss on ignition of the oven-dried samples, and shall contain a concentration of nutrients equal to that in any Government-furnished topsoil. If, after the testing of the samples, the topsoil is found to be not in accordance with these specifications, the Contracting Officer may require as a requisite for acceptance, that the contractor, without additional compensation, add humus as directed, to the topsoil proposed for use, in order to make the material acceptable, and that he add fertilizer as directed in addition to the quantity specified, to raise the concentration of nutrients to a level equal to that in the Government-furnished topsoil, after fertilization. The depth to which topsoil is to be stripped shall be as approved, and samples drawn from the area shall be taken from the full stripping depth approved.

b. Fertilizer and Lime. - The Contracting Officer shall be furnished with duplicate copies of invoices for all fertilizer and lime used on the project. Invoices for fertilizer shall show the grade furnished. Invoices for lime shall show total minimum carbonates and minimum percentages of the material furnished that pass the 100- and the 200- mesh sieves. Each lot of fertilizer and lime shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the official methods of the Association of Official Agricultural Chemists. Upon completion of the project, a final check of the total quantities of fertilizer and lime used will be made against the total area seeded, and, if the minimum rates of application have not been met, the Contracting Officer may require the distribution of additional quantities of these materials to make up the minimum application specified.

c. Seed. - The Contracting Officer shall be furnished with duplicate signed copies of a statement from the seed vendor, certifying that each container of seed delivered is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements for seed in the MATERIALS paragraph of this section of the specifications, as furnished with the purchase order. This certification shall appear on, or with, all copies of invoices for the seed. Each lot of seed shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the latest Rules and Regulations under the Federal Seed Act.

d. Mulch. - No less than 30 days prior to commencement of mulching operations, the contractor shall notify the Contracting Officer of the sources from which the mulch materials are to be secured and the quantities thereof, and representative samples of the materials proposed to be used shall be furnished for approval.

e. Jute Erosion-Control Matting. - A representative sample of the jute matting consisting of not less than one square yard shall be furnished for approval.

f. Nomenclature. - The scientific and common names of seed materials specified herein conform with the latest approved names listed in "Standardized Plant Names" (1942 Edition) prepared by the American Joint Committee on Horticultural Nomenclature. Variety names not included therein are in conformance with names adopted by the U. S. Department of Agriculture and generally accepted in the seed trade.

17-06. PREPARATION OF SUBGRADE. - a. General. - Equipment necessary for the proper preparation of the ground surface and for handling and placing all materials required shall be on hand, in good condition, and shall be approved by the Contracting Officer before the work is started.

b. Clearing of Subgrade. - Prior to grading and tillage operations, all vegetation on the site sufficient to interfere with grading or tillage operations shall be mowed, grubbed, raked, and burned or removed from the site, or, when suitable, it shall be used for mulch as directed by the Contracting Officer. Prior to or during grading and tillage operations, the ground surface shall be cleared of all stumps, stones larger than 2 inches in diameter, roots, cable, wire, grade stakes, and any other materials which might hinder proper grading, tillage, or subsequent maintenance operations.

c. Grading of Subgrade. - Grades on the areas to be topsoiled which have been established by others, as shown on the drawings, shall be maintained in a true and even condition. Maintenance shall include necessary repairs to previously graded areas. Where the grades have not been established, the areas shall be graded to finish grade elevations less the depth of topsoil to be applied, as shown on the drawings, and all surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand. The subgrade elevation at any point shall not vary more than plus or minus one tenth foot from finish grade elevations less the depth of topsoil, as shown on the drawings. Swales, ditches, slopes and level areas shall be accurately graded to required subgrade elevations.

d. Tillage of Subgrade. - After the areas required to be topsoiled have been brought to the proper subgrade parallel to the finished grades shown on the drawings, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by disking, or by scarifying to a depth of at least 2 inches, to permit bonding of the topsoil to the subgrade. On banks and inclines, the subgrade finish shall be loosened by harrowing in rows parallel to the contours of the slope. All other equipment to be employed on such slopes shall be operated similarly.

e. Approval of Subgrade. - There shall be no application of topsoil made without the prior approval of the finished subgrade by the Contracting Officer.

17-07. OBTAINING TOPSOIL. - After inspection and approval by the Contracting Officer of the source(s) of topsoil, and prior to stripping, rank growths of vegetation, stones, or debris on the surface which might interfere with grading or later tillage operations shall be removed. Sod or other cover that cannot be disked or otherwise incorporated into the topsoil before or after delivery, in such manner that it can be spread properly, shall be removed. Where topsoil is to be made available on areas to be graded, the topsoil shall be removed to the required depth from the designated areas prior to the beginning of grading operations. The topsoil removed from areas to be stripped or areas to be graded, or obtained from designated Government stockpiles, shall be kept separate from other excavated material. When topsoil is to be stripped and salvaged from wooded areas, or from areas where boulders, large stones or similar materials are present, clearing and grubbing shall be accomplished in accordance with the requirements of Section 1, PREPARATION OF SITE. Immediately following the clearing and grubbing operation, roots, stones, stumps and similar material shall be removed from the soil to the depth of topsoil salvaged by means of a bulldozer (crawler tractor) equipped with a root-raking or land-clearing rake or blade (Drott 95-inch width to 151-inch width or equal on I.H. TD-9 to TD-25 or equal) and by a tractor-drawn stone rake. Topsoil from a wooded area shall not be salvaged, stockpiled or reused until it has been demonstrated to the Contracting Officer that removal of stones, stumps and other materials having a dimension of 2 inches or over has been accomplished. All topsoil, regardless of the source, shall be transported and placed by the contractor. When topsoil is stockpiled for later use, the stockpiles shall be maintained free of weeds. Weed growth shall be prevented by the application of a suitable herbicide or by frequent cutting or pulling of plants.

17-08. PLACING TOPSOIL. - The topsoil shall be uniformly distributed on the designated areas and evenly spread, and in sufficient depth to compensate for any shrinkage, so that the thickness of the compacted topsoil shall be as indicated on the drawings; or when not so indicated to a minimum depth of four (4) inches. The topsoil depth shall be measured perpendicular to the plane of the finished grade. The spreading shall be performed in such a manner that fine grading, fertilizing, liming and seeding can proceed with little additional soil preparation or tillage. Irregularities in the surface resulting from operations thereon shall be corrected to prevent the formation of depressions where water will stand. Topsoil shall not be placed or worked when it or the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to the proposed seeding or to proper grading. Topsoiling shall be performed only when it can be followed within a reasonable time by seeding. If excess topsoil remains after all requirements have been met, such excess shall be spread over the spoil areas, unless all or part of such excess is directed by the Contracting Officer to be left stockpiled.

17-09. PREPARATION OF SEEDBED. - a. General. - It shall be demonstrated to the Contracting Officer before starting work that the application of fertilizers, lime, and seed required will be made uniformly and at the specified rates.

b. Fine Grading. - The seedbed shall be brought to the required finished grades, free from unsightly variations, lumps, ridges, and depressions, through successive stages of light rolling, fine grading, and hand and machine raking operations. Grades and elevations shall be properly set and marked by means of stakes, string lines, spot elevations and similar means when necessary or when required by the Contracting Officer. Rolling shall be accomplished with a roller weighing approximately 75-pounds per foot of width. During such operations and prior to seeding, the surface shall be cleared by whatever means are necessary including hand raking of all stones, stumps, or other objects larger than 1 inch in thickness or diameter in areas designated in Paragraph 17-03b(1), and larger than 2 inches in thickness or diameter in all other seeded areas except borrow areas. All roots, brush, wire, grade stakes, and other objects that may be a hindrance to maintenance operations shall be removed.from all seedbeds. Finely pulverized seedbeds shall be formed. The elevation of the seedbed surface at any point shall match exactly the elevation at adjacent pavement edges, curbs, manhole rims and finish grade elevation lines at structures, and overlot shall not vary more than plus or minus one tenth of a foot (.10 foot) from the elevations shown on the drawings or interpolated from the contours, sections, or details, except in spoil areas, where variations in the smoothness of the finished surface up to .30 ft. (three tenths of a foot) will be acceptable.

c. Application of Fertilizer and Lime. - Fertilizer and lime shall be distributed uniformly over the areas specified to be topsoiled and seeded, in accordance with the following schedule:

Material	Rate in Pounds Per 1,000 S.F.	Per Acre
Fertilizer	25	1,000
Lime	100	2 Tons

Each material shall be incorporated independently into the top 3 inches of soil by disking, harrowing, drill, or other methods acceptable to the Contracting Officer during fine grading operations. Distribution of fertilizer and seed may be accomplished simultaneously by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time at the appropriate stage for seeding operations.

d. Leveling. - Any undulations or irregularities in the surface resulting from tillage, fertilizing, liming, or other operations shall be leveled out before seeding operations are begun. No seeding shall be done until the prepared seedbed has been approved by the Contracting Officer.

17-10. PLANTING SEED. - a. General. - All seeding work shall be done between the dates of 15 April and 1 June or between 15 August and 15 September except as otherwise directed in writing by the Contracting Officer.

A method of sowing satisfactory to the Contracting Officer shall be employed, making use of approved mechanical power-drawn drills or seeders or mechanical hand-seeders. Regardless of the type of sowing equipment used, the seedbed shall be pulverized to a depth of three inches before seed is applied. When drills are used, provisions shall be made by markers or other means to assure that the successive seeded strips will overlap or be separated by a space no greater than the space between the rows planted by the equipment being used. When delays in operations carry the work beyond the most favorable planting season for the species designated, or when conditions are such, by reason of drought, high winds, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the Contracting Officer will stop the work, and work shall be resumed only when directed. If inspection, during seeding operations or after there is a show of green, indicates that strips wider than the space between the rows planted have been left, or other areas skipped or too sparsely seeded, the Contracting Officer may require corrective work and the sowing of additional seed on such areas. When the equipment used leaves wheel marks, tire marks, or ruts in the seedbed, such marks and ruts shall be removed by hand raking or the addition of topsoil and seeded.

b. Rates. - Seed shall be sown at the minimum rate of 3 pounds per 1,000 square feet.

c. Broadcast Seeding. - Seed shall be broadcast by approved sowing equipment. The seed shall be uniformly distributed over the designated areas. Half the seed shall be sown with the sower moving in one direction, and the remainder shall be sown with the sower moving at right angles to the first sowing. The seed shall be covered to an average depth of 1/4 inch by means of a brush harrow, chain harrow, cultipacker, or other approved device. Broadcast seeding shall not be done during windy weather.

d. Drill Seeding. - Drill seeding shall be done with approved equipment with drills not more than 2 inches apart. The seed shall be sown uniformly over the designated areas, and covered to an average depth of 1/4-inch concurrently with the sowing.

e. Floss Spraying. - The application of fertilizer and seed to slopes of 1 on 3 or steeper, in the Borrow Area, and on the slopes of the Sutcliffe Road, Munn Road, Dike and approaches, the seedbeds having been prepared in accordance with the provisions of this section of the specifications, may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area resulting deposits of fertilizer and seed shall be equal in quantity to those quantities specified herein. In no case shall lime be sprayed simultaneously with fertilizer and seed, nor shall any materials be used that have been standing in solution for a

period exceeding 8 hours. After the spraying has been accomplished, the surface of the loam shall be compacted by rolling as specified below. If the results of the spraying operations are unsatisfactory, the contractor will be required to abandon this method and to apply the materials as described hereinbefore. If the floss spraying method is used, the requirement for pulverizing the seedbed shall be met, in accordance with Paragraph 17-10 of this section of the specifications. However, the requirements for covering the seed after application to a depth of 1/4 inch as stated in Subparagraphs 17-10c and d of this section of the specifications and the requirements for incorporating fertilizer into the top 3 inches of soil as stated in Paragraph 17-09c of this section of the specifications will be waived.

17-11. COMPACTING. - Immediately after the operations specified above have been completed, the entire area shall be compacted by means of a cultipacker, roller, or other approved equipment weighing 60 to 90 pounds per linear foot of roller. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic roller (not wobble-wheel) will be required. The pneumatic roller shall have tires of sufficient size so that complete coverage of the soil surface is obtained. When a cultipacker or similar equipment is used, the final rolling shall be at right angles to the existing slopes to prevent water erosion or at right angles to the prevailing wind to prevent dust, as directed by the Contracting Officer.

17-12. APPLYING MULCH. - The mulch shall be spread uniformly on all seeded areas in continuous blanket, as follows: Straw or hay at the rate of 2 tons per acre. If the mulching material is too long and brittle for proper securing in the surface soil, it shall be cut by an ensilage cutter or other equipment to lengths of not more than 8 inches and watered as needed before spreading, to assure proper securing of mulch into the soil as specified hereinafter. The mulch shall be spread by hand or by use of a manure spreader, a modified grain combine with straw-spreader attachment, a blower or other suitable approved equipment. Mulching shall be started at the upper part of a slope, and shall continue uniformly until the area is completely covered.

17-13. SECURING MULCH. - Immediately following the spreading of the mulch, the material shall be anchored to the soil by a V-type wheel landpacker, a disk harrow set to cut only slightly, a rotary hoe run backwards, or other suitable approved equipment which will secure the mulch firmly in the ground to form a soil-binding mulch and prevent loss or bunching by wind. The number of passes over the mulch needed to secure it firmly to the soil shall be as determined by the Contracting Officer, but shall in no case exceed three passes. On slopes where machinery cannot be used, mulch shall be retained in place by a shallow covering of earth, by pressing into the soil at 18-inch intervals with a spade or other approved tool, by twine, stakes, or brush, or by other suitable means which will not be detrimental to subsequent maintenance.

17-14. REMOVAL OF MULCH. - Whenever in the opinion of the Contracting Officer the mulch material becomes injurious to the treated area because of decomposition, matting or bunching, or when growth of grass is retarded or maintenance impeded, the contractor shall carefully remove the mulch, transport it, and deposit it in an approved spoil area.

17-14A. INSTALLATION OF JUTE EROSION CONTROL MATTING. - a. Area Where Matting is Required. - Jute matting shall be installed in all areas indicated on the drawings, and in accordance with sketch "Jute Matting, Installation Details" attached at end of this section.

b. Soil Preparation. - After the areas to receive jute matting have been shaped to the grades and cross sections shown on the drawings, they shall be scarified, cleaned up, fertilized, limed, topsoiled and seeded in conformance with the provisions of this section of the specifications, except that:

(1) No rolling or compacting of the soil surface shall be done prior to installing the jute matting. It is essential to have a loose, pulverized soil in which to bed the jute matting.

(2) Only half the seed shall be applied prior to placing the jute matting. The other half shall be applied immediately following placement of the jute matting.

c. Placing Jute Matting. - Jute matting shall be laid flat, parallel to the flow of water. Where more than one strip is required, they shall overlap at least 4 inches. Ends shall overlap at least 6 inches, with the up-grade section on top. The up-slope end of each strip of matting shall be buried in 6-inch deep slots with the soil firmly tamped against it.

Check slots shall be placed between the end of strips by placing a tight fold of the matting at least 6 inches deep vertically in the soil. These shall be tamped and stapled the same as up-slope ends.

The edges of matting shall be similarly buried around the edges of inlets and other structures.

Matting shall be spread evenly, loosely, and smoothly and in contact with the soil at all points. It shall be pressed into the soil with a light lawn roller or by a tamper.

The matting shall be held in place by staples as specified driven vertically into the soil. Staples shall be spaced not more than 3 feet apart in three rows for each strip, with one row along each edge and one row alternately spaced in the center. All ends of the matting and check slots shall have the staples spaced 10 inches apart across their width.

d. Maintenance and Repair. - The contractor shall maintain the jute matted areas until all work on the entire contract has been completed and accepted. Maintenance shall consist of the repair of areas damaged by erosion, wind, fire, or other causes. Such areas shall be repaired to re-establish the condition and grade of the soil prior to application of the matting, and shall be retilled, refertilized, reseeded, and remulched as specified under this section of the specifications.

17-15. PROTECTION. - The topsoiled and seeded areas shall be protected against traffic and other use by erecting barricades or a substantial wire and stake enclosure immediately after seeding and mulching operations have been completed, and by placing warning signs of a type approved by the Contracting Officer on the completed areas. The contractor shall repair any damage resulting from his operations. All mulch material which has been removed from the site by wind or from other causes shall be replaced and secured. Repair work which is required because of the contractor's negligence shall be performed without cost to the Government.

17-16. CLEAN-UP. - The contractor shall leave each area neat and clean, with adjacent turf and tree-covered areas raked of extraneous matter, and with all debris removed from the site. Any paved area over which hauling operations are conducted shall be kept clean and any topsoil, mulch, clippings, or other material which may be brought upon the paved surface shall be removed promptly. Rocks, stumps, trees, limbs, excess earth material and debris of all kinds shall be removed from the seeded areas and their perimeters and spoiled.

17-17. ESTABLISHMENT. - a. General. - The contractor shall be responsible for the proper care including watering of the seeded and mulched areas during the period when the grass is becoming established. This period shall extend for 45 days after the completion of the seeding on the entire project or until final acceptance of all elements of the completed project, whichever period is longer. In the event seeding is completed after 15 September, and final acceptance of all elements of the project except seeding occurs prior to May 15 of the succeeding year, this ESTABLISHMENT period shall extend to May 15 of the succeeding year.

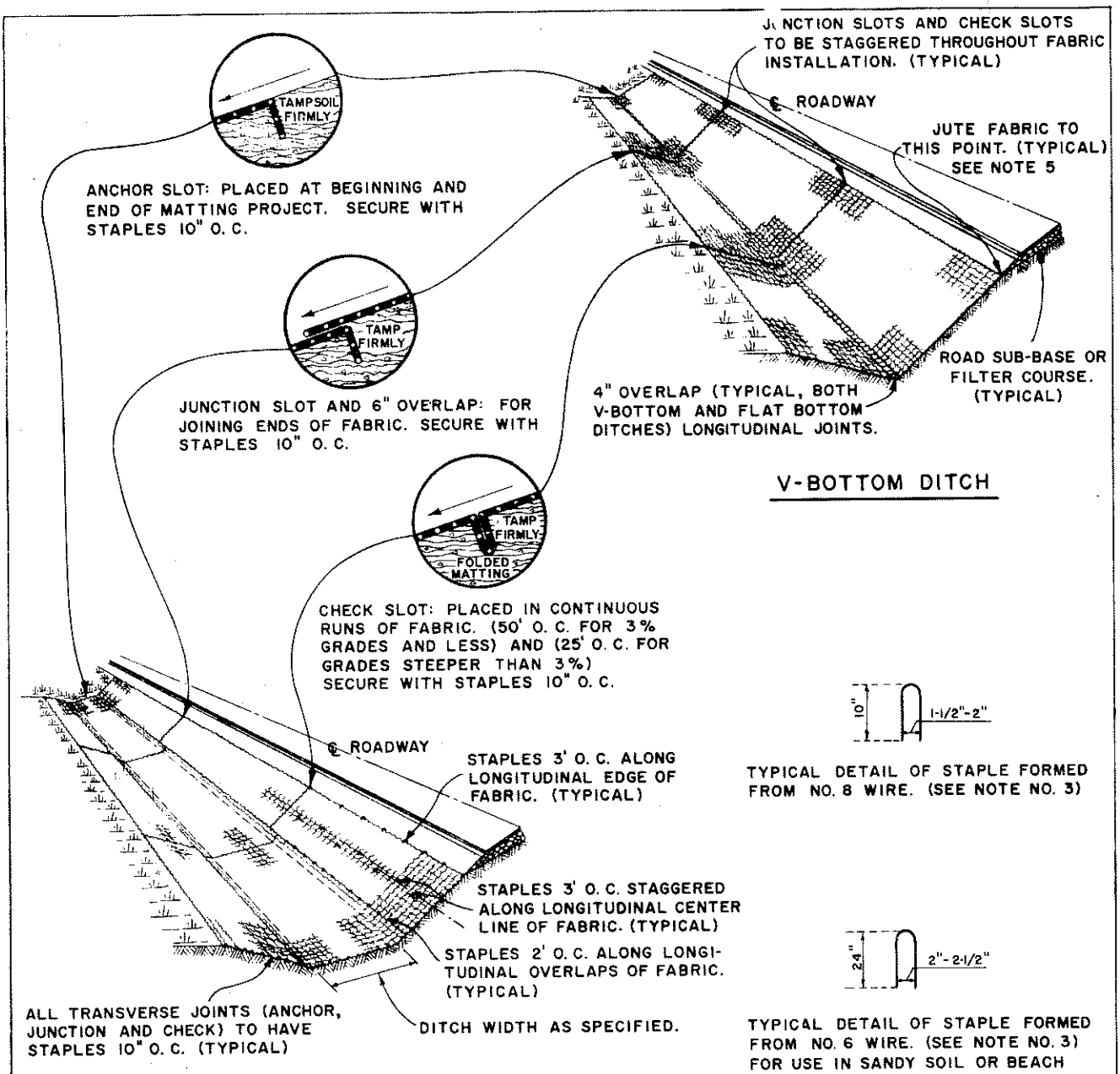
b. Watering. - The contractor shall be responsible for the watering of all seeded and grassed areas which shall be kept moist. The Contracting Officer's decision will prevail in the event a dispute develops with the contractor as to whether or not the seeded and grassed areas are moist. Seeded areas on which growth has started shall be watered to a minimum depth of 2 inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment. The contractor shall furnish sufficient watering equipment to apply one complete coverage to the seeded areas in a 96-hour period.

indicated on the drawings or as staked in the field. Payment for topsoiling will be made at the contract unit price for Item 49, "Topsoiling, Rehandle and Place", which price shall include all costs of salvaging, furnishing, segregation from excavations, loading, hauling, preparation of subgrade, spreading topsoil, grading, tillage, preparation of seedbeds, all labor and incidentals. No measurement or payment for placing stripping material will be made in borrow areas where all operations in connection with stripping, stockpiling and replacing stripping material shall be considered operations incidental to the borrow excavation operations. No measurement or payment will be made for areas specified in Paragraph 17-03a(2) and (3).

b. Seeding. - (1) Areas seeded will be measured by the acre on the basis of the number of acres measured. The acres will be computed to the nearest 1/10th of an acre. For measurement purposes, acres to be computed will be considered as horizontal projections of the ground surface. Payment for seeding will be made at the contract price per acre for Item 50, "Seeding on Class A and B Seedbeds", which price shall include all costs of finished grading, preparation of seedbed, application of fertilizer, lime and mulch, application of seed, and the furnishing of all labor, materials, including seed, fertilizer, lime and mulch, equipment and incidentals necessary to complete the seeding, and costs of maintenance and establishment. No measurement or payment will be made for seeding areas specified in Paragraphs 17-03a(2) and (3) and for seeding in borrow area.

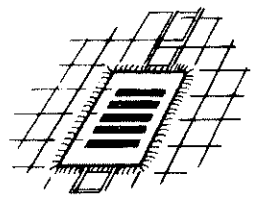
(2) In Borrow Areas. - No measurement or payment will be made for seeding in Borrow Areas, including establishment and maintenance, where all operations in connection with seeding shall be considered subsidiary obligations of the contractor incidental to borrow excavation operations.

c. Jute Erosion Control Matting. - Jute erosion control matting will be measured for payment on the basis of the number of square yards of matting acceptably installed, maintained and repaired in accordance with the provisions of this section of the specifications, as computed from the neat lines and grades indicated on the drawings or as staked in the field. Payment for jute erosion control matting will be made at the contract unit price per square yard for Item 53, "Jute Erosion Control Matting", which price shall include all costs of preparation of areas of application, installation of the matting, and maintenance and repair as required by Paragraph 17-14Ad of this section of the specifications, and the furnishing of all labor, materials, including matting and staples, equipment and incidentals necessary to complete the installation of the matting. No measurement or payment will be made for work included under other payment items.



NOTES:

1. PROVIDE SMOOTH CHANNEL TO REDUCE TURBULENCE AND UNDER-CUTTING. ROCKS, ROOTS AND LUMPS CAUSE BRIDGING, ALLOWING WATER TO FLOW UNDER MATTING.
2. ALL SLOTS (ANCHOR, JUNCTION AND CHECK) TO BE 6" TO 8" DEEP. MATTING TO BE PRESSED FIRMLY INTO SOIL AND STAPLED.
3. STAPLES MADE FROM NO. 6 OR 8 WIRE SHALL BE USED TO ANCHOR MATTING. STAPLES MUST BE FLUSH WITH GROUND TO ASSURE SMOOTH WATER FLOW.
4. WHERE JUTE MATTING IS SPECIFIED FOR HIGH EMBANKMENT SLOPES THE FABRIC MAY BE LAID LONGITUDINALLY OR VERTICALLY ON THE SLOPE.
5. BEGIN JUTE INSTALLATION PARALLEL TO EDGE OF ROAD (OR AT TOP EDGE OF FIELD DITCH). PROGRESS LATERALLY TO TOP OF BACKSLOPE (OR FAR EDGE OF FIELD DITCH).



PRESS ENDS OF JUTE 6" INTO SOIL AROUND DRAIN. TAMP FIRMLY.

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

JUTE MATTING

INSTALLATION DETAILS

DATE: AUG. 1961

SECTION 18

STORAGE BUILDING
(Item 48)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
18-01	Scope	18-1
18-02	Excavation, Backfilling, and Grading	18-1
	a. General	18-1
	b. Grading	18-1
	c. Excavation	18-1
	d. Excess Material	18-2
	e. Sand and Gravel Fill	18-2
	f. Filling near Foundation Walls	18-2
	g. Backfilling	18-2
18-03	Concrete	18-2
	a. General	18-2
	b. Slabs on Grade	18-3
18-04	Sheet Metal Work and Miscellaneous Metals	18-3
	a. Materials	18-3
	b. Flashing	18-3
18-05	Carpentry	18-3
	a. Lumber and Woodwork	18-3
	b. Other Materials	18-4
	c. Framing and Boarding	18-5
	d. Exterior Finish	18-6
	e. Window Frames	18-6
	f. Sash	18-6
	g. Insect Screens	18-7
	h. Door Frame	18-7
	i. Doors	18-7
	j. Blocking	18-8
18-06	Laboratory Equipment	18-8
	a. Table	18-8
	b. Sink	18-8
	c. Tank	18-8

Paragraph No.	Paragraph Title	Page No.
18-07	Painting	18-8
	a. General	18-8
	b. Materials	18-8
	c. Workmanship	18-8
18-08	Electrical Work	18-9
18-09	Builders' Hardware	18-9
	a. General	18-9
	b. Lock Sets	18-9
	c. Materials	18-9
	d. Key	18-10
	e. Finish	18-10
18-10	Roofing	18-10
18-11	Shades	18-10
	a. General	18-10
	b. Materials	18-10
	c. Installation	18-11
18-12	Payment	18-11

SECTION 18

STORAGE BUILDING
(Item 48)

18-01. SCOPE. - a. The work covered by this section of the specifications consists in furnishing all labor, plant, equipment, materials and appliances, and performing all operations in connection with construction of a storage building, complete, in strict accordance with this section of the specifications and Sketch No. 106, inclosed at end of this section, and subject to the terms and conditions of the contract.

b. The storage building will be located along existing Wales Road, downstream of the dam, where shown. The exact location will be determined in the field by the Contracting Officer. The contractor shall provide a suitable access driveway to the building.

c. The storage building will be utilized as a project laboratory during the work under this contract. The building shall be completed and all equipment installed in sufficient time to permit any required testing as required under Paragraph SC-40. The contractor shall maintain access to the building at all times, shall provide temporary electric service, and shall provide janitor and maintenance services, and shall pay for all electricity used during the contract work. The contractor shall provide drinking water, bottled water type dispenser, in the building.

d. All items installed in the building shall remain and become the property of the Government. The temporary electric service shall be removed upon completion of the entire work.

18-02. EXCAVATION, BACKFILLING, AND GRADING. - a. General. - All work shall be executed as required to construct the building including the access driveway (except gravel surface). Shoring and unwatering the construction area shall conform to the applicable requirements of Section 3, EXCAVATION, and as stated below. All excavation shall be unclassified and shall include the removal of any rock and boulders encountered. Road gravel shall be furnished and placed as specified in Section 6.

b. Grading. - The entire building area including access drive shall be rough graded prior to excavation or fill for the building foundations. Fill shall be brought up to the underside of subgrade for sand and gravel drainage fill under slabs and for subgrade for road gravel.

c. Excavation. - Excavations shall conform to the dimensions and elevations shown on the drawings or as required for the construction

of features covered in this section. Excavation shall generally extend 12 inches outside the walls to allow for placing and removal of forms, installation of services, and for inspection. Undercutting will not be permitted. Suitable excavated material which is required for fill under slabs shall be separately stockpiled as directed.

d. Excess Material. - Material from excavation, not required for fill or backfill, shall be used or disposed of as specified in Section 3 of these specifications.

e. Sand and Gravel Fill. - Sand and gravel fill under concrete slabs including ramp shall meet all the requirements for Gravel Fill material as specified in Section 5, except that the material shall contain no stones greater than 3 inches in size. The 6-inch layer of sand and gravel fill beneath floor and slab shall be placed in one layer and compacted by four coverages of vibratory compactors or pneumatic tampers.

f. Filling near Foundation Walls. - Where filling is done beside foundation walls, the fill shall be brought up essentially at the same heights on both sides at all times until the maximum level at the lower side is reached. Where a higher level of fill is required on one side of the foundation wall, the higher level must be properly compacted. Where a roller or tractor is used for compaction, the roller or tractor edge must not approach nearer than four feet from the face of the wall.

g. Backfilling. - After completion of foundation walls and other construction below the elevation of the final grade, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall consist of materials from required excavations or other materials approved by the Contracting Officer. Each layer shall be compacted by machine tampers or by other suitable mechanical equipment to a density that will prevent excessive settlement or shrinkage. Precautions outlined above relative to filling near foundation walls, shall be observed while backfilling.

18-03. CONCRETE. - a. General. - All concrete work required for the building shall conform with the applicable requirements of Section 9, CONCRETE, with the following additional provisions:

(1) The maximum size aggregate shall not exceed 3/4 inch.

(2) Finish. - The exposed concrete surfaces shall have all fine and rough edges removed, holes remaining from the bolts or rods and slight honeycomb and minor defects patched with mortar composed of 1 part cement to 2 parts sand. Concrete floor and ramp shall be left with a wood float finish.

(3) Expansion Joints. - Expansion joints shall be constructed as indicated on the drawings and where slab abuts vertical surfaces. Joints between slabs on earth and vertical surfaces shall be premolded expansion-joint filler strips conforming to Federal Specification HH-F-341a. Joints shall be 3/8 inch thick (unless otherwise shown) and the full depth of slab. Edges of concrete floor or along expansion joints shall be neatly finished with a slightly rounded edging tool.

b. Slabs on Grade. - The subgrade shall be brought to an even plane and compacted solid. Sand and gravel fill shall be deposited to the indicated thickness, and compacted and graded reasonably level. The fill under floor slab shall be covered with vapor barrier. Concrete shall be deposited to the required thickness, and finished as specified above.

18-04. SHEET METAL WORK AND MISCELLANEOUS METALS. - a. Materials. - (1) Anchor bolts for anchoring the sills to the foundation walls shall be 1/2-inch diameter, 12 inches long, spaced on four-foot centers. The projecting portion shall be given a coat of red lead.

(2) Sheet metal for cap flashing over doors and windows shall be 16-ounce cold rolled copper.

(3) Window grilles. - Grille frames shall be 1 x 1/2 x 1/8 inch cold rolled channels with covers mitered and welded. Fabric shall be No. 10 gage steel wire, woven into 1-1/2-inch diamond mesh securely clinched or welded to framing. Straps, 1/8-inch thick by 1-1/2-inch wide, spaced not over 18 inches apart and with one in each corner, shall be welded to frame for securing grilles to window frames. Straps shall be shaped as required and secured to building construction with lag screws extending through straps and at least 2 inches into building studding or blocking. Heads of lag screws shall be made tamperproof by welding head to straps or in a manner satisfactory to the Contracting Officer.

b. Flashing. - Cap flashing shall be provided at head of doors and windows to provide watertight protection. Exposed edges of all flashings shall be folded back 1/2 inch to provide stiffness. Flashing at openings shall extend not less than 4 inches beyond the jambs of the opening. Wall flashings shall be installed, as required, to provide watertight construction.

18-05. CARPENTRY. - a. Lumber and Woodwork. - Lumber shall conform to Federal Specification MM-L-00736a (GSA-FSS) for "Lumber and Timber, Hardwood", and MM-L-00751f (GSA-FSS) & Am-1, for "Lumber and Timber, Softwood". A certificate of conformance with Federal Specifications will be accepted in lieu of inspection requirements. At the contractor's option, lumber for the various uses shall be one of the species listed for the purpose and of the grade indicated.

(1) Rough Carpentry. -

	SPECIES AND GRADE		
	Douglas Fir Sitka Spruce Western Red Cedar	Northern White Pine Eastern Spruce	White Fir
Rafters, Sills and Joists	Any stress-graded species - 1100 f., 850 c., 1,320,000 E.		
Studs, Plates, Caps, Nailers	Standard	No. 2	No. 2
Roof and Wall Sheathing	Interior type Douglas fir plywood with exterior glue, C-D grade, minimum 1/2 inch thick.		
Bridging, Ridge Boards and Bracing	Standard	No. 3 Boards	No. 3

(2) Exterior Finished Carpentry. -

	SPECIES AND GRADE	
	Douglas Fir Sitka Spruce Western Red Cedar	Northern White Pine Eastern Spruce
Siding	C and better	C Select
Cornices	C and better	C Select
Trim and Corner Boards	C and better	C Select
Window and Door Frames	Practically clear material without obvious defects. Window jambs, parting strips, and sills of Douglas fir, and sills of Sitka spruce shall be VG or EG. Door frames shall be of second grade for paint finish.	

b. Other Materials. - (1) Waterproof Sheathing Paper. - Waterproof sheathing paper shall conform to Federal Specification UU-P-147b for "Paper; Building, Waterproof", Type I, Class B.

(2) Lag Screws. - Lag screws shall conform to Federal Specification FF-B-561b for "Bolts, Lag".

(3) Nails. - Nails shall conform to Federal Specification FF-N-105a for "Nails, Wire, Brads, and Staples".

(4) Screws. - Screws shall conform to Federal Specification FF-S-111b, for "Screw, Wood".

(5) Asphalt Saturated Felt. - Asphalt saturated felt shall conform to Federal Specification HH-F-191a & Am-2 for "Felt; Asphalt-Saturated (for) Flashings, Roofing, and Waterproofing"

(6) Glass. - Glass shall conform to Federal Specification DD-G-451a & Am-1 for "Glass, Flat and Corrugated for Glazing, Mirrors and Other Uses." All glass shall be type II, B quality, double-strength, clear glass.

c. Framing and Boarding. - (1) Lumber and Other Rough Work. - Lumber and other rough work shall be properly framed, closely fitted, accurately set to the required lines and rigidly secured in place. No shims will be allowed on wood or metal bearings. Members shall be framed to allow for passage of pipes to avoid cutting of structural members. No members shall be cut, notched, or bored for the passage of such pipes without prior approval. All corners shall be wind braced. Ridge shall be straight and true intersections of the roof planes. Rafters on plates and ridge shall be framed with close joints. Blocking not less than 2 x 4-inch stock or size of framing member shall be placed between rafters and studs where necessary to form nailings for roof and wall sheathing. Bridging shall be provided where required.

(2) Wall and Roof Sheathing. - All nailing shall be into framing. No nails shall be visible from interior of building.

(a) Wall Sheathing. - Edges or ends of plywood sheets shall extend over and be nailed to sill and top plates. End joints shall be butted over centerline of supports and when applied horizontally, end joints shall be staggered. Eightpenny common nails shall be used. Nails shall be spaced 6 inches on centers along ends and bearing edges and 12 inches on centers along intermediate bearings. Waterproof sheathing paper shall be applied over sheathing, shall be applied horizontally, starting at bottom, and lapped 6 inches at ends and edges.

(b) Roof Sheathing. - Plywood shall be provided with blocking installed at edges of sheets or H-shaped metal clips designed for the purpose shall be inserted along the edges midway between supports. Plywood panels shall be continuous over two or more spans, applied with the face-ply grain across supports and secured at 6 inches on centers along ends and bearing edges and at 12 inches on centers along intermediate bearings with eightpenny common nails. End joints shall be butted over the centerline of supports and staggered.

(3) Rafters and ceiling joists, sizes as shown, shall be spaced 16 inches on centers.

(4) Studs. - Studs shall be 2" x 4", spaced 16 inches on centers. Plates resting on concrete walls shall be anchored in place with 1/2-inch bolts. Studs shall be built-up double round openings and trussed over all doors and windows. Corners shall be thoroughly spiked together and made solid. All walls shall be provided with top and bottom plates. Walls shall have at least one row of horizontal bridging full width of studding, cut and securely nailed. Studs shall be framed as required for the proper installation of plumbing. Nailing strips shall be cut as required for the support of fixtures of all kinds.

d. Exterior Finish. - (1) All exterior finish shall be milled from materials specified and erected in strict conformance with details. The exposed surfaces of finish woodwork shall be smooth and ready to receive paint or other finish. All nailing shall be blind or face nailing as required with face nails set for putty-stopping. Cornice and other exterior trim and millwork shall be constructed so that water cannot pass through the joints. Molded work shall be coped at returns and interior angles and mitered at corners. Intersections of flat work shall be shouldered. Rake mouldings shall be run to profile required to miter with horizontal moldings.

(2) Wood siding shall be drop siding type and shall be applied over the wall sheathing and building paper. Ends of boards likely to split when nailed shall be drilled. End joints shall be made over centerline of framing supports. Joints shall be staggered and, when made on same support, shall be separated by at least two courses. End joints and joints at openings, corners, and gables shall be made with white-lead paste. Siding shall be nailed to each support with not less than two nonferrous metal nails. Nails shall be of the length that will penetrate sheathing and provide not less than 1-1/2-inch penetration into support. Siding courses shall fit full into the worked edges of the adjacent board without forcing.

e. Window Frames. - Double-hung frames shall have 3/4 inch jambs, heads, and blind stops, 1/2-inch by 3/4-inch parting strips, 1-5/8-inch sills and 1-1/8-inch side and head castings. Jambs and heads shall be cut as required by the type of spring balances specified. Sills shall be run with weather breaks on top and one or more grooves on bottom.

f. Sash. - Nominal thickness of double-hung sash shall be 1-3/8 inches. Ponderosa Pine sash shall conform to CS 163 59 & Errata sheet, 2 February 60. Sash of Douglas fir, cypress, or southern pine shall be of the same construction and quality as specified for Ponderosa pine. Double-hung sash shall be check-rail type, shall be grooved for attachment of sash balances. Sash shall be fitted closely after frames are set, shall be made to work free and easy, and shall be well-balanced. Windows shall be of a type that can be easily removed from the interior for cleaning. All glass shall be set in best quality putty.

g. Insect Screens. - Half-length insect screens, wood or metal type optional with contractor shall be provided for all windows.

h. Door Frame. - Exterior door frame for swing door shall be 1-3/4 inches thick, double-rabbeted from the solid. Double wedge blocking shall be driven back of jambs at nailing points and at back of butts and lock strikes.

i. Doors. - (1) General. - Doors shall be of the design and sizes indicated and shall be fabricated in accordance with the best practice of the trade, with all joints properly formed, tightly fitted and tenoned. Exterior door shall be flush type, 1-3/4-inch thick. Exterior door shall be provided with interlocking type threshold and shall be completely weatherstripped at sill, jambs, and head.

(2) Swing Door. - Top and bottom edges of door shall be given two coats of spar varnish at the factory before shipment. Exterior door shall be fabricated with water-resistant adhesives. Exterior door shall be softwood-veneered and shall have solid core of the stile and rail-type. Door, when constructed without cross-banding, shall have sawn or sliced face veneers not less than 3/16-inch thick before sanding, and when cross-banded, combined thickness of cross-banding and face veneer on each face shall be not less than 3/16-inch before sanding. Otherwise, softwood-veneered door of Ponderosa Pine shall conform to CS 120-58, grade 1; of Douglas fir, Sitka spruce, or western hemlock shall have vertical grain faces for paint finish and construction and quality shall be equal to those required by CS 91-41.

(3) Overhead Door. - Door shall be sectional overhead type and shall be constructed of 1-3/8-inch thick, mortised and tenoned, glued, steel doweled, stiles and rails with rebated weather joints throughout. Stiles shall be 3-1/2 inches wide at centers and 5-1/2 inches wide at ends. Center rails shall be 2-9/16" minimum, and top and bottom rails shall be 5-1/2" wide. Door shall be furnished with rubber weatherstrip at bottom. Door panels shall be 1/4-inch thick exterior grade plywood. Provide one horizontal row of fixed glazed panel in door; glass shall be bedded in elastic glazing compound. Counter balancing hardware shall be torsion-spring type on cross header steel shaft. All metal parts such as tracks, guides, bracing and hardware shall be furnished with the door to complete the installation. Tracks shall be 2-inch size and furnished for a 10-inch maximum head radius with adjustable jamb brackets on the verticals. All metal parts shall be galvanized steel. Door sections shall be hinged at rail center stile and end stile. Door shall be erected in accordance with manufacturer's instruction.

(4) Fittings, Hanging and Trimming. - The contractor shall set, fit, and hang all doors. Swing door shall have 1/16-inch clearance

at side and top and 3/8-inch clearance at the bottom, and shall be hung and trimmed with hardware as specified. Screens shall be provided with aluminum glides and shall be fitted and made insect tight.

j. Blocking. - Wood blocking and strapping shall be furnished as required for proper support or finish and sheathing and for attachment of other items of work.

18-06. LABORATORY EQUIPMENT. - a. Table. - Table shall be 30 inches high, shall be of metal, shall be equipped with four drawers, and shall be constructed with sturdy metal frame.

b. Sink. - One single stainless steel sink, connected to trap and drain line. Drain line shall be carried outside the building to natural drain. Drain line shall be so constructed that fine-grained soils and cement may be washed down drain without plugging the system. Sink shall be provided with one cold water faucet. The contractor shall mount a 100-gallon tank outside the building to provide water supply for sink, and shall fill tank as required. The sink trap shall conform to Federal Specification WW-P-541b & Am-4, No. 106 trap.

c. Tank. - The tank shall be a curing tank and constructed of 14-gage galvanized sheet metal reinforced to perform satisfactorily. The tank shall be equipped with drainage plugs, electric stirrer and immersion heater, thermostatically controlled which will maintain a constant uniform water temperature between 68° F. and 78° F. All necessary electric outlets and services for operation of stirrer and heater shall be supplied.

18-07. PAINTING. - a. General. - The contractor shall paint all exterior woodwork, including door and window frames, siding, window sills, and trim, and door butts. Painting shall include both sides of swing and overhead doors. No interior painting is required.

b. Materials. -

Prime Coat - Federal Specification TT-P-25a & Am-1.
Finish Coats - Federal Specification TT-P-102a, Class B, light tints; TT-P-53c & Am-1, yellow; TT-P-81d other medium colors. Color shall be selected by Contracting Officer from color chips submitted by contractor. Two colors shall be required, one for siding, and the other for doors, windows and trim. Paint will be accepted on the basis of certificates of compliance.

c. Workmanship. - The contractor shall apply one prime coat and two finish coats to all surfaces required to be painted. Paint shall be applied in accordance with manufacturer's instructions and as specified in the applicable Federal Specifications.

18-08. ELECTRICAL WORK. - a. The contractor shall provide a temporary service to the building. The building shall be provided with a 120/240 volts, 100-amp, single phase, 3-wire, electric system.

b. The contractor shall provide a 7-1/2 KW unit heater. Lighting fixtures shall be commercial fluorescent type. Each receptacle shall be on a separate circuit. Lighting shall be controlled by switch near door.

c. All electrical work shall conform to the National Electrical Code and any applicable local and utility regulations.

18-09. BUILDERS' HARDWARE. - a. General. - Builders' hardware shall be furnished and installed as required by the specifications. All items of builders' hardware shall be carefully fitted and securely attached. Care shall be exercised not to mar or injure other new work. Upon completion of the work, the contractor shall, in the presence of the Contracting Officer, show that all hardware works in perfect order, shall fit all keys in their respective locks, and upon acceptance of the work shall tag and deliver all keys to the Contracting Officer. Oilite bearing butts may be furnished in lieu of ball bearing butts at option of the contractor.

b. Lock Sets. - Lock sets shall embody locking mechanism herein specified and trim conforming to the design specified. Where the exact types of hardware specified are not adaptable to the finished shape or size of members requiring the hardware, suitable types having as nearly as practicable the same operation and quality as type specified shall be furnished. Locks shall have beveled, rounded or rabbeted faces where required. Solid or wrought bronze knobs shall be installed on the swing door.

c. Materials. - Materials, unless otherwise specified, shall conform to the applicable requirements of the following Federal Specifications:

FF-H-106a & Am-1	Hardware, Builders; Locks and Door Trim.
FF-H-111a & Am-1	Hardware, Builders; Shelf and Miscellaneous.
FF-H-116c & Am-4	Hinges, Hardware, Builders.

Hardware for the various items shall conform to the requirements set forth below:

Double Hung Windows

2 Sash Balances	Type F1245
1 Fastener	Type 1140
2 Sash Lifts	Type 1212

Window Screens

Sash Lifts Type 1212 - 2 each screen

Overhead Door

Hardware as recommended by door manufacturer for type of door specified. Door shall be provided with a cylinder locking device which provides for operations from both sides of door with key from exterior.

Exterior Door

3 Butts - 4-1/2 x 4-1/2	Type 2107 x USP
1 Lock and Lock Set	Type 161A-4

d. Key. - Each cylinder lock shall be spin tumbler type and shall be provided with three keys. All locks shall be keyed alike. All keys shall be stamped with the change number.

e. Finish. - Hardware for exterior face of exterior door and window sash, unless otherwise specified, shall be dull bronze; US-10. All butts shall have a priming coat for painting.

18-10. ROOFING. - Thick butt asphalt strip shingles conforming to Federal Specification SS-S-298b, or uniform thickness shingles conforming to Federal Specification SS-S-300b, type II, shall be applied by workmen skilled at the trade and shall be laid in accordance with the manufacturer's specifications. Shingles shall be 3 tab, and except at ridges, shall be 12 inches by 36 inches. Colors shall be selected from manufacturers' standard color range by the Contracting Officer. Shingles shall be laid with wood shingle starter course with all courses not more than 5 inches to the weather. A layer of asphalt saturated felt shall be nailed on the sheathing prior to application of shingles.

18-11. SHADES. - a. General. - Shades shall be installed on all windows.

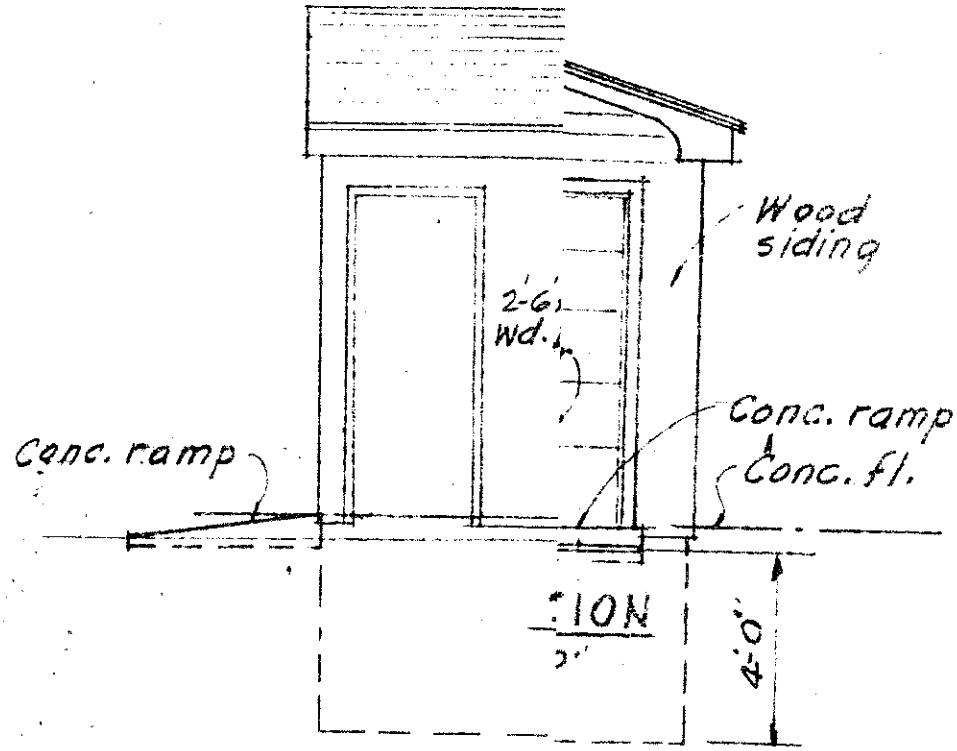
b. Materials. - Materials shall conform to the following Federal Specifications:

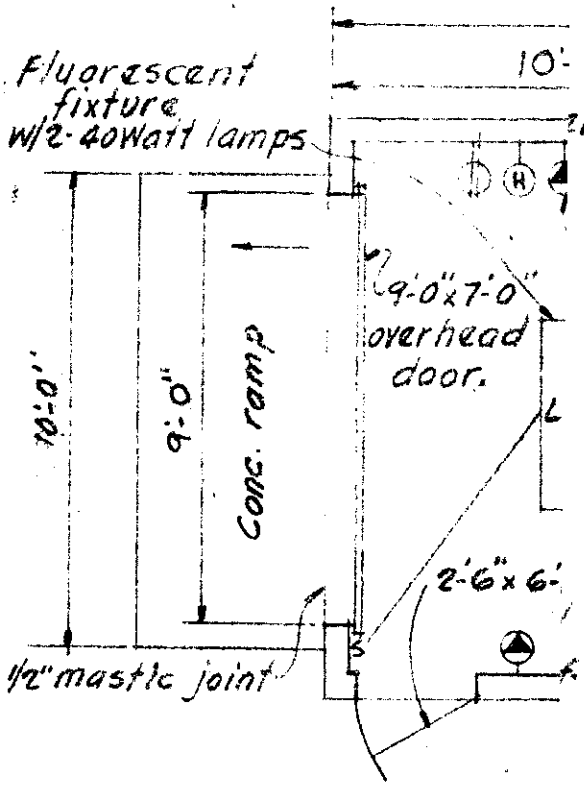
DDD-S-251c	Shades, Roller, Window; Roller, Slat, Cord, and Accessories.
CCC-C-521c & Am-1	Cloth, Coated Window Shade, white color.

Brackets may be malleable iron, stamped steel, or brass, with a brass, copper, nickel, or chromium finish.

c. Installation. - Shades shall be installed in accordance with the manufacturer's instructions. Brackets shall be accurately located and solidly fastened in place, care being taken not to mar or damage existing work. The contractor shall operate all shades in the presence of the Contracting Officer before final acceptance.

18-12. PAYMENT. - Payment for all work specified herein, except for gravel access drive will be made at the lump sum contract price for the Item 48, "Storage Building", and will include all costs for grading, earth and rock excavation for foundations, backfilling, fill, heating, electrical and plumbing, and concrete.





U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

CONNECTICUT RIVER FLOOD CONTROL PROJECT

CONANT BROOK DAM
STORAGE BUILDING
PLAN, ELEVATIONS & SECTION

CONANT BROOK MASSACHUSETTS

SK. NO. 106 DATE: JAN. 1964

STANDARD FORM 21
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE
Serial No. CIVENG-19-016-64-43

Read the Instructions to Bidders (Standard Form 22)
This form to be submitted in duplicate

DATE OF INVITATION
2 April 1964

NAME AND LOCATION OF PROJECT
CONSTRUCTION OF CONANT BROOK DAM, HIGHWAY RELOCATIONS, AND APPURTENANT STRUCTURES, MONSON, MASS.

NAME OF BIDDER *(Type or print)*

(Date)

TO: Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham, Mass. 02154

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for the Construction of Conant Brook Dam, Highway Relocations and Appurtenant Structures, Monson, Massachusetts

in strict accordance with the General Provisions (Standard Form 23-A), Labor Standards Provisions Applicable to Contracts in Excess of $2,000 (Standard Form 19-A), specifications, schedules, drawings, and conditions, for the following amount(s)

See attached Unit Price Schedule.

Supplement to Bid Form, Pages numbered 1 and 2, Certification of Noncollusion (Nov. 1963), and Plant and Equipment Schedule, attached hereto, forms a part of this bid as does attached Unit Price Schedule

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within calendar days (60 calendar days unless a different period be inserted by the bidder) after the date of opening of bids, he will within 10 calendar days (unless a longer period is allowed) after receipt of the prescribed forms, execute Standard Form 23, Construction Contract, and give performance and payment bonds on Government standard forms with good and sufficient surety.

The undersigned agrees, if awarded the contract, to commence the work within
15 calendar days after the date of receipt of notice to proceed, and to complete the work within
* calendar days after the date of receipt of notice to proceed.
*For completion date or dates see Paragraph SC-1 of the specifications.

(Continue on other side)

Receipt of Amendments: The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. *(Give number and date of each)*:

The bidder represents *(Check appropriate boxes)*:

(1) That he☐is,☐is not, a small business concern. *(For this purpose, a small business concern is a business concern, including its affiliates, which (a) is independently owned and operated, (b) is not dominant in its field of operation, and (c) had average annual receipts for the preceding three fiscal years not exceeding* $7,500,000 *For additional information see governing regulations of the Small Business Administration.)*

(2) (a) That he☐has,☐has not, employed or retained any company or person other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and (b) that he☐has,☐has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer.

(For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Subpart1-1.5.)

(3) That he operates as an☐individual,☐partnership,☐joint venture,☐corporation, incorporated in State of .....

Enclosed is bid guarantee, consisting of

in the amount of

NAME OF BIDDER *(Type or print)*	FULL NAME OF ALL PARTNERS *(Type or print)* (with residential addresses)
BUSINESS ADDRESS *(Type or print)*	
BY *(Signature in ink. Type or print name under signature)*	
TITLE *(Type or print)*	

DIRECTIONS FOR SUBMITTING BIDS

Envelopes containing bids, guarantee, etc., must be sealed, marked, and addressed as follows:

Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham, Mass. 02154

Bids may be delivered in advance to the Bids Receiving Desk in Bldg. 109S at the above address, or delivered directly to the Contracting Officer in Bldg. 126 (Theater) just prior to the bid opening.

CAUTION: Bids should not be qualified by exceptions to the bidding conditions.

UNIT PRICE SCHEDULE

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
1	Preparation of Site	1	Job	L.S.	$_____
2	Control and Diversion of Water	1	Job	L.S.	_____
*3	Unclassified Excavation-General	180,000	C.Y.	$_____	_____
*4	Unclassified Excavation-Borrow	330,000	C.Y.	_____	_____
*5	Rock Excavation	60,000	C.Y.	_____	_____
6	OMITTED				
7	Hand Cleaned Bedrock Surfaces	300	(100 sq. ft.) Square	_____	_____
8	Foundation Drilling and Grouting				
	a. Mobilization and Demobilization	1	Job	L.S.	_____
	b. Drilling 1-1/2"(EX) Grout Holes	1650	L.F.	_____	_____
	c. Drilling 3"(NX) Drain Holes	140	L.F.	_____	_____
	d. Drilling 3"(NX) Exploratory Holes	100	L.F.	_____	_____
	e. Portland Cement in Grout	1400	C.F.	_____	_____
	f. Sand in Grout	100	C.F.	_____	_____
	g. Placing Grout	1500	C.F.	_____	_____
	h. Connection to Grout Holes	285	Ea.	$5.00	1,425.00
*9	Compacted Highway Fill	91,000	C.Y.	_____	_____
*10	Compacted Impervious and Random Fills	220,000	C.Y.	_____	_____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
11	Compacted Impervious Backfill	300	C.Y.	$____	$____
*12	Compacted Processed Sand Fill	10,000	C.Y.	____	____
13	Compacted Gravel Fill	1,200	C.Y.	____	____
14	Compacted Gravel Backfill	150	C.Y.	____	____
*15	Compacted Sand Fill	30,000	C.Y.	____	____
*16	Gravel Bedding	27,500	C.Y.	____	____
17	Road Gravel	1,300	C.Y.	____	____
18	Additional Rolling of Fill	100	Hrs.	____	____
*19	Rock Slope Protection	48,000	C.Y.	____	____
20	Anchor Bars	23	Ea	____	____
21	Concrete-Outlet Works-Intake and Outlet	500	C.Y.	____	____
22	Concrete-Outlet Works-Conduit Sta. 3+93 to Sta. 7+77	480	C.Y.	____	____
23	Concrete-Spillway-Weir and Walls	550	C.Y.	____	____
23A	Concrete for Foundation Preparation	50	C.Y.	$60.00	3,000.00
24	Portland Cement	2400	Bbl.	____	____
25	Steel Reinforcement	20,000	Lb.	____	____
26	Pipe Conduit	1	Job	L.S.	____
27	Bubble Gage Shelter	1	Job	L.S.	____
28	Pipe, ACCM, 15-inch	430	L.F.	$____	____
29	Pipe, ACCM, 18-inch	55	L.F.	____	____
30	Pipe, ACCM, 21-inch	85	L.F.	____	____
30A	Pipe, ACCM, 24-inch	70	L.F.	____	____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
31	Pipe, ACCM, 30-inch	135	L.F.	$_____	$_____
32	Pipe, Culvert, ACCM, 54-inch	1	Job	L.S.	_____
33	Pipe, Culvert, Bituminous Coated, Multi-Plate, 15-foot diameter	1	Job	L.S.	_____
34	Pipe, Culvert, Bituminous Coated, Multi-Plate, 17-foot diameter	1	Job	L.S.	_____
35	Drop Inlets (Type C)	4	Ea.	_____	_____
36	Pipe Bedding	880	C.Y.	_____	_____
36A	Culvert Backfill	2,090	C.Y.	_____	_____
37	Miscellaneous Metal Items Intake and Outlet Structures	1	Job	L.S.	_____
38	Chain Link Fencing	1,900	L.F.	_____	_____
39	Gates - 12 feet, Chain Link	3	Ea.	_____	_____
40	Log Boom	1	Job	L.S.	_____
41	Staff Gages	1	Job	L.S.	_____
42	Cable Guard Railing	6,010	L.F.	_____	_____
43	Bumper Guard	175	L.F.	_____	_____
44	Gravel Base and Surface Courses and Shoulders	18,300	C.Y.	_____	_____
45	Bituminous Concrete Pavement, 2-inch	4,100	S.Y.	_____	_____
45A	Bituminous Concrete Pavement, 2-1/2-inch	31,500	S.Y.	_____	_____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
46	Bituminous Surface Treatment	3,200	S.Y.	$_____	$_____
47	Bituminous Concrete Berms	375	L.F.	_____	_____
48	Storage Building	1	Job	L.S.	_____
49	Topsoiling, Rehandle and Place	7,100	C.Y.	_____	_____
50	Seeding on Class A and B Seedbed	20	Acre	_____	_____
51	Concrete Bounds	75	Ea.	_____	_____
52	Paved Ditches	950	S.Y.	_____	_____
53	Jute Erosion - Control Matting	1,300	S.Y.	_____	_____
				TOTAL	$_____

NOTES: 1. The work will be awarded as a whole to one bidder

2. Only quantities for items with an asterisk adjacent to Item No. are subject to the provisions of Subparagraphs SC-7a and SC-7c of the SPECIAL CONDITIONS.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Excavation Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Concreting Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Material Handling Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Pumping Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Earth Embankment - Rolled Fills

Excavation and Transportation - Spreading and Rolling

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Miscellaneous Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

SUPPLEMENT TO BID FORM
(Construction Contract)

If a bid or modification to a bid based on unit prices is submitted and provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price, including lump sum units, in the bid schedule must be stated or, if it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a prorata basis to every unit price in the bid schedule.

In case of error in the extension of prices, the unit price will govern.

The bidder warrants that he has available or under his control plant of the character and in the amount required to complete the proposed work within the specified time.

It is hereby warranted that in the event award is made to the bidder, there will be furnished under this contract, or used in the performance of the work covered by this contract, only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States and only such manufactured articles, materials, and supplies as have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States, except as noted below or otherwise indicated in this bid or authorized in the invitation.

Mistakes in Bids. - The bidder hereby waives that portion of any alleged mistake or mistakes in his bid as submitted which falls within the following amounts:

If bid is $250,000 or less -- 5% of the bid;

If bid is more than $250,000 and less than $500,000 - $12,500 plus 4% of the bid over $250,000;

If bid is $500,000 or more, and less than $1,000,000 - $22,500 plus 3% of the bid over $500,000;

If bid is $1,000,000 or more - $37,500 plus 2% of the bid over $1,000,000.

In cases where the allegation of mistake exceeds the above waived amounts and the request for correction is allowed, such amount will be excluded from the contract price; however, the amount waived as provided herein will not be deducted for the purpose of evaluating bids to determine the low bidder.

SUPPLEMENT TO BID FORM
(Construction Contract)

The above waiver does not apply to any clerical mistake which is obvious or apparent on the face of the bid including but not limited to (1) a mistake in the extension of a unit price or prices; (2) a mistake in totaling the sums of various bid items; (3) obviously misplaced decimal point or (4) failure to insert the unit price where amount intended can be determined from face of bid.

This clause is not applicable to allegations of mistakes which, if allowed, would result in a reduction in the bid price.

3/23/60

The following information is required and should be submitted with your bid if the amount of the bid exceeds $10,000.00.

PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER

(a) Bidder represents that he ☐ is, ☐ is not, owned or controlled by a parent company. For this purpose a parent company is defined as one which either owns or controls the activities and basic business policies of the bidder. To own another company means the parent company must own at least a majority (more than 50 percent) of the voting rights in that company. To control another company such ownership is not required; if another company is able to formulate, determine or veto basic business policy decisions of the bidder such other company is considered the parent of the bidder. This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements, or otherwise.

(b) If the bidder is owned or controlled by a parent company, insert in the space below, the name and main office address of the parent company.

_____ _____

Name Address

(c) Bidder will provide in the applicable space below, if he has no parent company, his own Employer's Identification Number (E. I. No.) (Federal Social Security Identification Number used on Federal Tax Return) or, if he has a parent company, the E. I. No. of his parent company.

Bidder's E. I. No. _____

Parent Company's E. I. No. _____

Rev. 5/7/68

CERTIFICATION OF NONCOLLUSION (NOV. 1963)

(a) By submission of this bid, the bidder certifies in connection with this procurement that:

(1) the price in this bid has been independently arrived at without collusion with any other bidder or with any competitor;

(2) unless otherwise required by law, the price in this bid has not been knowingly disclosed and will not be knowingly disclosed prior to opening, directly or indirectly to any other bidder or to any competitor; and

(3) no attempt has been or will be made to induce any other person or firm to submit or not to submit a bid.

(b) The person signing this bid certifies that he has fully informed himself regarding the accuracy of the statements contained in this certification.

(c) A bid will not be considered for award where (a)(1), (a)(3), or (b) above has been deleted or modified. Where (a)(2) above has been deleted or modified, the bid will not be considered for award unless the bidder furnishes with the bid a signed statement which sets forth in detail the circumstances of the disclosure and the head of the agency, or his designee, determines that the disclosure was not made with collusive intent.

COMPLIANCE REPORTS RE NON-DISCRIMINATION CLAUSE
(Applicable to all contracts over $10,000.)

The bidder represents that he ( ) has, ( ) has not, participated in a previous contract or subcontract subject to either the non-discrimination in employment clause herein or the clause originally contained in Section 301 of Executive Order 10925, that he ( ) has, ( ) has not, filed all required compliance reports; and that representations indicating submission of required compliance reports, signed by proposed subcontractors will be obtained prior to subcontract awards.

Connecticut River Flood Control - Westfield - Local Flood Protection Project - 1963



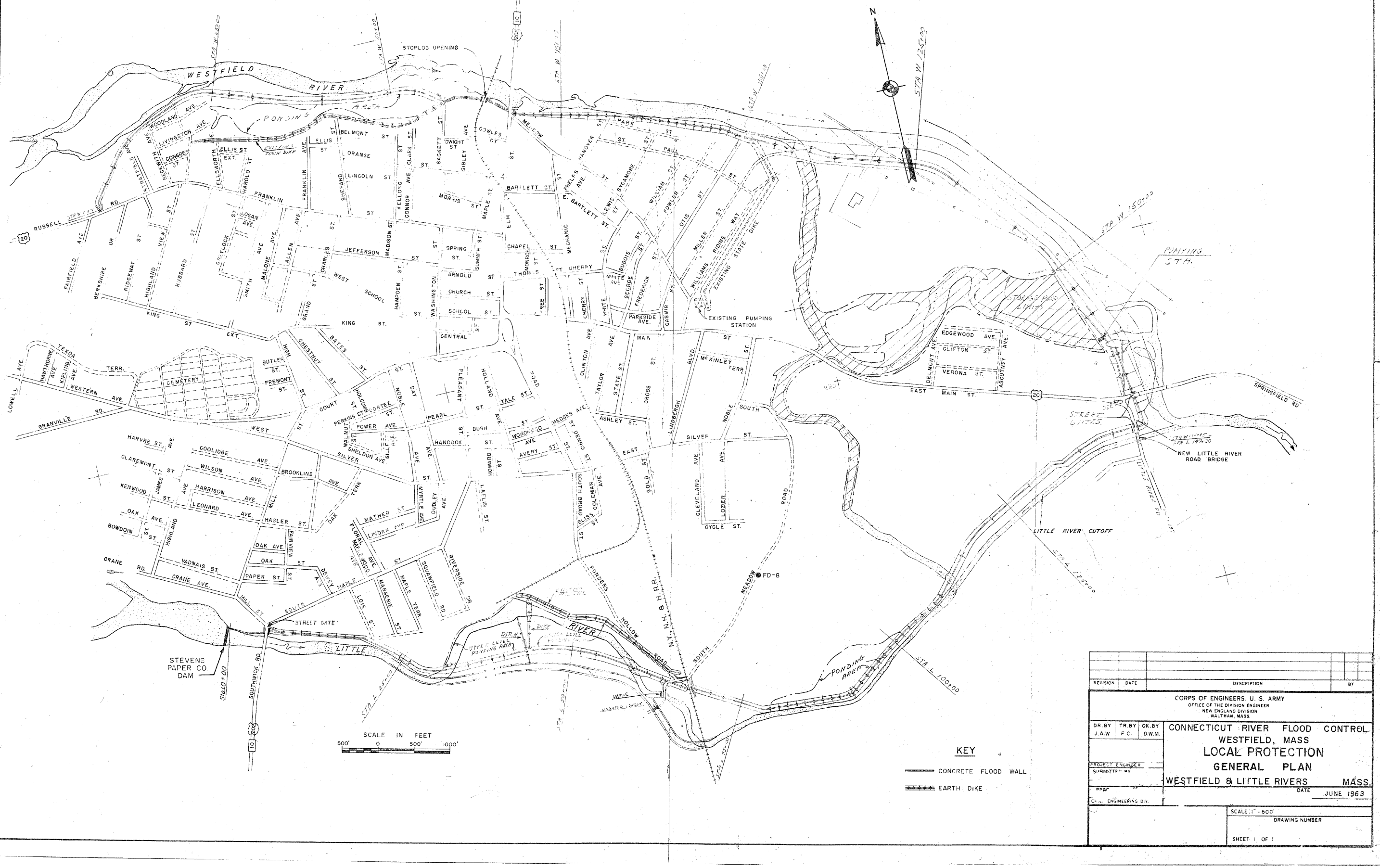
1963 Reports

"Connecticut River Flood Control - Westfield, Mass, Local Protection General Plan - Westfield & Little Rivers - June 1963 - U S Army Corps of Engineers."

Bridges	New York New Haven & Hartford Railroad Bridge
Bridges	Elm Street Bridge
City/Town	Westfield
Dam	Little River Dam
Name	U S Army Corps of Engineers
Railroads	New York New Haven & Hartford Railroad
Streets	Route 187
Streets	Route 202
Streets	Route 10
Streets	Little River Road
Streets	Route 20
Streets	Springfield Road
Water	Little River
Water	Conenecticut River
Water	Westfield River

CORPS OF ENGINEERS

U.S. ARMY



REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
J.A.W	F.C.	D.W.M.

PROJECT ENGINEER
SUBMITTED BY
CHIEF ENGINEERING DIV.

CONNECTICUT RIVER FLOOD CONTROL
WESTFIELD, MASS
LOCAL PROTECTION
GENERAL PLAN
WESTFIELD & LITTLE RIVERS MASS.

DATE JUNE 1963

SCALE 1" = 500'

DRAWING NUMBER

SHEET 1 OF 1

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM 54. MASS.

ADDRESS REPLY TO:
DIVISION ENGINEER

REFER TO FILE NO.
NEDGB

2 July 1963

Hampden County Commissioners
37 Elm Street
Springfield, Massachusetts

Gentlemen:

This office is currently in the process of designing the Westfield Local Protection Project, in the City of Westfield, Massachusetts. The General Design Memorandum is scheduled for submission in September 1963.

This project is located in the City of Westfield, Hampden County, Massachusetts. It is approximately 11 miles west of Springfield, Massachusetts, 43 miles east of Pittsfield, Massachusetts, and about 30 miles north of Hartford, Connecticut. It extends along the south bank of the Westfield River and along the north bank of the Little River within the City. The project provides for the construction of earth dikes and floodwalls along the Westfield and Little Rivers, excavation of cutoff channels on both rivers, construction of a pumping station, and appurtenant works.

Two new channels will be excavated, one cutting off the oxbow on the Westfield River and the other straightening the Little River. The Westfield River cutoff, 7000 feet long, will start approximately 3200 feet downstream from the Elm Street Bridge. The Little River cutoff, 4100 feet long, will start approximately 4000 feet downstream from the New York, New Haven and Hartford Railroad Bridge over the Little River and extend to its new confluence with the Westfield River just downstream from the Springfield Road (Route 20) Bridge. A new bridge will be required where Little River Road (Route 187) crosses the channel cutoff. The bottom widths of the cutoff channels will be 200 feet and 70 feet for the Westfield and Little Rivers, respectively.

There will be about 31,700 feet of dike necessary for the protection; 17,500 feet will be along the right bank of the Westfield River and its new channel. It will vary in elevation from 147 to 160 m.s.l.; 14,200 feet along the left bank of the Little River and its new channel, and this will vary from elevation 147.0 to 167 m.s.l. Use will be made of the existing dikes around the City. The top width will be 10 feet with 1 vertical to 2.5 horizontal riverside slope and 1 vertical to 2 horizontal landside slope.

NEDGB
Hampden County Commissioners

2 July 1963

There will be three (3) street gates required where the dike crosses existing ways: two will be required along the Little River dike, one at Route 20 & 202, and another at Little River Road. The third will be on Route 20, Springfield Road on the Westfield River. A railroad concrete stoplog structure will be provided where the New York, New Haven and Hartford railway crosses the dike on the right bank of the Westfield River. A 500-foot length of reinforced concrete wall at elevation 172.0 m.s.l. and an average height of 25 feet will be required to complete the tie into an existing dam (Stevens Mill Dam) just west of the Route 20 & 202 bridge crossing of the Little River on the left bank.

Two ponding areas will be provided behind the Westfield River dike for the storage of water from interior runoff and seepage during design conditions for the project. The main ponding area will utilize the existing stream bed of the Westfield and Little Rivers from which the river flow has been diverted due to realignment of the river channels. A pumping station will be provided and will be located just upstream of the Route 20 bridge crossing of the Westfield River. Under design conditions, water will pond to elevation 120 m.s.l. in this area. Another storage area will be available between the existing dike upstream of the New York, New Haven and Hartford railroad bridge crossing of the Westfield River and the new dike. Water will pond in this area to elevation 138.5 m.s.l. under design conditions. This area will be drained by gravity through a gated conduit.

Three ponding areas are proposed for the Little River drainage area. The existing river channel just upstream of the New York, New Haven and Hartford railroad bridge crossing of the Little River will be used as a storage area. This area will be divided into two areas separated by a dike. One pond will store water to elevation 140.5 and the other to elevation 147.5 under design conditions. These areas will be drained by gravity through gated conduits. A second area will be east of the New York, New Haven and Hartford railroad embankment adjacent to the toe of the proposed dike. Water will pond in this area to elevation 134.5 feet m.s.l. under design conditions. A gated conduit will be provided to drain this area.

Your comments on the above proposal are requested. There is attached one print of the proposed plan.

Sincerely yours,

JOHN WM. LESLIE
Chief, Engineering Division

Incl
Print

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Westfield
July 22, 1963.

The Hon. the Board of County Commissioners
37 Elm Street
Springfield, Mass.

Gentlemen:

Reference is made to the communication from the U. S. Army Engineer Division, New England Corps of Engineers, dated 2 July 1963 and to the plan submitted with the letter showing proposed local flood protection for Westfield, Mass.

The communication and the plan show the general method for providing improved flood protection for the City of Westfield from flood waters carried by the Westfield River and by Little River. A description of the flood protection work is contained in the communication.

I have reviewed the communication and the plan and have made a very preliminary study of the proposed flood protection work, together with the storage ponds for storing surface water within the protected area. The only conflict between the letter and the drawing is the reference to Route 20 and Route 202 bridge crossing, as well as street gate at Little River and its proposed dikes. The letter should have referred to Route 10 and 202, rather than Route 20 and 202.

I am of the opinion that the work as proposed, does not come under the jurisdiction of the County, except perhaps for the storage ponds behind the dikes. However, in the past, I do not recall that the Corps of Engineers have filed plans for storage ponds in connection with dikes constructed for communities throughout the County. It might be well, however, to ask the Corps of Engineers to keep you informed of the progress of the work and to file plans with you of the storage ponds, their related dikes and other facilities.

A suggested communication to the U.S. Army Engineer Division, New England Corps of Engineers, is enclosed.

I am returning to you enclosed, the communication received by your Board and the copy of the plan of the proposed flood protection work.

Very truly yours

George H. McDonnell
County Hydraulic Engineer

GHM/cmb
enc.

Connecticut River Flood Control Project - Westfield River Littleville Dam - Volume 1 1962



1962 Reports

Specifications for construction of Dam and appurtenant structures. Middle branch of Westfield River.

City/Town	Westfield
City/Town	Westfield
Dam	Littleville Dam
Name	Massachusetts Comm
Name	U S Army Engineers
Water	Westfield River
Water	Connecticut River

Serial No. CIVENG-19-016-62-49

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR

CONSTRUCTION

OF

LITTLEVILLE DAM

AND

APPURTENANT STRUCTURES

MIDDLE BRANCH, WESTFIELD RIVER

MASSACHUSETTS

15 March 1962

FACILITIES DESIGNED BY N.E.D.

VOLUME I OF III

Administrative Provisions
&
Technical Provisions
(Sections 1 - 14)

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

NED NEW ENGLAND DIVISION

Wear Your HARD HAT

"a little care makes mishaps rare"



The Head You Save WILL BE YOUR OWN

U.S. ARMY CORPS OF ENGINEERS

TABLE OF CONTENTS

VOLUME I OF III

INVITATION FOR BIDS

BID FORM

PART I - GENERAL CONDITIONS

PART II - SPECIAL CONDITIONS

PART III - TECHNICAL PROVISIONS

Section No.	Title
1	PREPARATION OF SITE
2	CONTROL OF DIVERSION OF WATER
3	EXCAVATION - OPEN CUT
4	EXCAVATION - TUNNEL AND SHAFT - ITEMS 7 & 8
5	ROCK BOLTING
6	TUNNEL RIB SUPPORTS
7	EMBANKMENTS
8	ROCK SLOPE PROTECTION, SELECTED RIPRAP AND GRAVEL BEDDING
9	MISCELLANEOUS FILLS, ROADS, DRIVES, AND PARKING AREAS
10	CULVERT
11	FOUNDATION DRILLING AND GROUTING
12	TUNNEL GROUTING
13	ANCHOR BARS
14	CONCRETE

VOLUME II OF III

15	48-INCH WATER SUPPLY PIPE
16	WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
17	FLOAT WELL AND AIR VENT
18	SLUICE GATES, VALVES AND ACCESSORIES
19	OMITTED
20	OMITTED
21	OMITTED
22	TRAVELING CRANES
23	DIESEL ENGINE-GENERATOR SET
24	VENTILATING SYSTEM, MECHANICAL
25	ELECTRICAL WORK; INTERIOR
26	HEATING SYSTEMS, FORCED-WARM-AIR: OIL-FIRED FURNACE
27	ELECTRICAL-EXTERIOR
28	STRUCTURAL STEEL BRIDGES
29	MISCELLANEOUS METAL ITEMS
30	METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES
31	METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

VOLUME III OF III

Section No.	Title
32	TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS
33	MISCELLANEOUS ITEMS OF WORK
34	UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
35	PLUMBING, GENERAL-PURPOSE
36	HEATING SYSTEM; FORCED-HOT-WATER, OIL-FIRED
37	WATER SUPPLY WELLS
38	WATER AND SEWER SYSTEMS
39	OMITTED
40	PAINTING
41	BITUMINOUS CONCRETE PAVEMENT
42	BITUMINOUS SURFACE TREATMENT
43	TOPSOILING, SEEDING AND MULCHING

STANDARD FORM 20
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

REFERENCE

Serial No. CIVENG-19-016-62-49

INVITATION FOR BIDS
(CONSTRUCTION CONTRACT)

DATE

15 March 1962

NAME AND LOCATION OF PROJECT

CONSTRUCTION OF LITTLEVILLE DAM AND APPURTENANT STRUCTURES, MIDDLE BRANCH WESTFIELD RIVER, MASSACHUSETTS

DEPARTMENT OR AGENCY

Department of the Army
Corps of Engineers

BY *(Issuing office)*

Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

Sealed bids in duplicate for the work described herein will be received until 2:00 p.m., E.S.T., 25 April 1962,

at the address of the Division Engineer, U.S. Army Engineer Division, New England, 424 Trapelo Road, Waltham 54, Mass.

and at that time publicly opened.

Information regarding bidding material, bid guarantee, and bonds

1. Bids may be mailed to: The Division Engineer, U.S. Army Engineer Division, New England, 424 Trapelo Road, Waltham 54, Mass.

2. In lieu of mailing, bids may be delivered in advance to: The Bids Receiving Desk, Building 109S at the above address. Just prior to the bid opening, bids may be delivered directly to the Contracting Officer in Bldg. 126 (Theater).

3. Bids will be opened at: Bldg. 126 (Theater), 424 Trapelo Road, Waltham 54, Mass.

4. Bids shall be submitted on Standard Form 21 (Bid Form-Construction Contract) and shall be prepared in accordance with Standard Form 22 (Instructions to Bidders). The bidder who is awarded the contract will be required to execute the standard contract form for construction contracts (Standard Form 23) attached hereto with Standard Form 23A, General Provisions, and supplement thereto, which set forth the contract clauses.

5. Bid Bond on U.S. Standard Form No. 24 in a penal sum of not less than 20% of the bid price or in a penal sum of $3,000,000, whichever is the lesser amount will be required with each bid if the bid price is in excess of $2,000. Failure to submit Bid Bond with bid will cause bid to be rejected.

Description of work: The work consists of furnishing all plant, labor, materials, and equipment and performing all work in strict accordance with the specifications, drawings and schedules for the construction of dam, dike, concrete structures, buildings, and utilities as follows:

Specifications entitled: "CONSTRUCTION OF LITTLEVILLE DAM AND APPURTENANT STRUCTURES, MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS"
Drawings as listed in Paragraph SC-3 of the specifications.
Schedules as set forth in the Bid Form

BIDS MUST SET FORTH FULL, ACCURATE, AND COMPLETE INFORMATION AS REQUIRED BY THIS INVITATION FOR BIDS, INCLUDING ATTACHMENTS. THE PENALTY FOR MAKING FALSE STATEMENTS IN BIDS IS PRESCRIBED IN 18 U.S.C. 1001.

(ICB)

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

1. Each bidder shall furnish a list of the plant available to the bidder and proposed for use on the work.

2. Bidders are required to acknowledge receipt of all amendments to this invitation on the Bid Form (Standard Form 21) in the space provided, or by separate letter or telegram prior to opening of bids. Failure to acknowledge all amendments may cause the bid to be considered not responsive to the invitation, which would require rejection of the bid.

3. If the bidder, by checking the appropriate box provided therefor in this bid, has represented that he has employed or retained a company or person (other than a full-time bona fide employee working solely for the bidder) to solicit or secure his contract, he may be requested by the Contracting Officer to furnish a completed Standard Form 119, "Contractor's Statement of Contingent or Other Fees for Soliciting or Securing Contract". If the bidder has previously furnished a completed Standard Form 119 to the office issuing this Invitation for Bids, he may accompany his bid with a signed statement, (a) indicating when such completed form was previously furnished, (b) identifying by number the previous invitation for bids or contract, if any, in connection with which such form was submitted, and (c) representing that the statements in such previously furnished form are applicable to this bid.

4. Modifications Prior to Date Set for Opening Bids. - The right is reserved, as the interest of the Government may require, to revise or amend the specifications and/or drawings prior to the date set for opening bids. Such revisions and amendments, if any, will be announced by an amendment or amendments to ths Invitation for Bids. Copies of such amendments as may be issued will be furnished to all prospective bidders. If the revisions and amendments are of a nature which require material changes in quantities or prices bid or both, the date set for opening bids may be postponed by such number of days as in the opinion of the Division Engineer will enable bidders to revise their bids. In such cases, the amendment will include announcement ment of the new date for opening bids.

5. The Government further reserves the right to make award on any or all schedules of any bid, unless the bidder qualifies such bid by specific limitation; also to make award to the bidder whose aggregate bid on any combination of bid schedules is low.

6. Repeal of Federal Transportation Tax on Property. - Section 4, Tax Rate Extension Act of 1958, (Act 30 June 1958, Public Law 85-475), in Part repealed the Federal excise tax on the transportation of property effective with respect to amounts paid for such transportation on and after August 1958.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

Accordingly, any bid price(s) submitted hereunder which include freight charges should exclude any amount(s) for Federal excise tax on the transportation of property.

Wherein these instructions conflict with Clause 35 "Federal, State and Local Taxes", of the Supplement to General Provisions (Construction Contracts) S.F. 32A, March 1952 Edition, these instructions will govern.

7. Information Regarding Buy American Act. - Pursuant to the Buy American Act (41 U. S. Code 10 a-d), it is generally required that only domestic construction materials will be used in the performance of the contract (See Clause entitled "Buy American Act" of General Provisions of Standard Contract Form 23). This requirement does not apply to construction materials, or their components, included in the list set forth in paragraph 6-206 of the Armed Services Procurement Regulation or set forth below:

Antimony, as metal or oxide
Asbestos, amosite
Bismuth
Cadmium, ores and flue dust
Chalk, English
Chrome, ore or chromite
Cobalt, in cathodes, rondelles or other primary forms
Cork, wood or bark and waste
Damar gum
Graphite, natural, crystalline, crucible grade
Jute and jute burlaps
Kaurigum
Lac
Logs, veneer, and lumber from Alaskan yellow cedar, angelique balsa, ekki, greenheart, lignum vitae, mahogany, and teak
Mica
Nickel, primary, in ingots, pigs, shot, cathodes, or similar forms; nickel oxide and nickel salts
Rubber, crude and latex
Shellac
Tin, in bars, blocks, and pigs

Additional exceptions are permitted if the Government determines as to particular construction materials that the requirement would be impracticable or would unreasonably increase the cost. Therefore, bids or proposals proposing the use of nondomestic construction materials (other

than those referred to above) may be eligible for award if such nondomestic construction materials are specifically designated in the bid or proposal and if accompanied by data demonstrating that, as to each such designated nondomestic construction material, use of any corresponding domestic construction material would be impracticable or would unreasonably increase the cost. If the Government determines that an exception from the Buy American Act should be made, an exception for the particular construction materials designated will be noted in the contract and the findings which justified the exception may be inspected upon request.

To show that the use of a particular domestic construction material would unreasonably increase the cost, accompanying data must show that the cost of any available acceptable domestic construction material, delivered at the construction site would exceed by more than six percent (6%) the cost of the designated nondomestic construction material delivered at the construction site (including any applicable duty.) The accompanying data shall reflect a thorough canvas of dealers and suppliers handling the construction materials involved.

8. Affiliated Bidders. - a. Business concerns are affiliates of each other when either directly or indirectly (i) one concern controls or has the power to control the other, or (ii) a third party controls or has the power to control both.

b. Each bidders shall submit with his bid an affidavit containing information as follows:

(i) whether the bidder has any affiliates;

(ii) the names and addresses of all affiliates of the bidder; and

(iii) the names and addresses of all persons and concerns exercising control or ownership of the bidder and any or all of his affiliates, and whether as common officers, directors, stockholders holding controlling interest, or otherwise.

READ THE FOLLOWING IN CONJUNCTION
WITH INSTRUCTIONS TO BIDDERS
(U. S. STANDARD FORM 22)

SUPPLEMENT TO INVITATION FOR BIDS
(Construction Contract)

9. Sets of drawings full size or reduced to half-size, and of specifications will be furnished upon receipt of payment of $10.00 per set. If individual plan sheets are requested, they will be furnished at the rate of $0.10 for half-size and $0.50 for full size for each sheet requested, but with a minimum charge of $1.00 except as provided for below. No refund of the payment for the drawings will be made and the drawings need not be returned to the Division Engineer. Additional copies of the specifications alone will be furnished an applicant at the rate of $1.00 per copy. Payments will be made by cash, check, or money order and delivered to the Finance and Accounting Officer, Corps of Engineers, Department of the Army, 424 Trapelo Road, Waltham, Mass. Checks and money orders should be made payable to "Treasurer of the United States". If the project is cancelled or no award is made under the invitation, upon request, refund of the payment for the plans and specifications will be made thereon upon return thereof to the issuing office, all charges prepaid.

10. Technical inquiries regarding the plans and specifications during the bidding period shall be made to the following:

Philip B. Thoresen, Waltham, Mass. TWinbrook 4-2400, Ext. 263

11. Reverse Signal Alarms. - See Paragraph SC-30 of the Special Conditions, relative to requirements for providing self-propelled construction equipment with reverse signal alarms.

12. Performance of Work by Contractor. - The contractor shall submit with his bid a description of the work that he will perform with his own forces, the percentage of the total work this represents, and the estimated cost thereof. See Paragraph SC-33 of the Special Conditions.

STANDARD FORM 21
JANUARY 1961 EDITION
GENERAL SERVICES ADMINISTRATION
FED. PROC. REG. (41 CFR) 1-16.401

BID FORM
(CONSTRUCTION CONTRACT)

REFERENCE
Serial No. CIVENG-19-016-62-49

Read the Instructions to Bidders (Standard Form 22)
This form to be submitted in duplicate

DATE OF INVITATION
15 March 1962

NAME AND LOCATION OF PROJECT
CONSTRUCTION OF LITTLEVILLE DAM AND APPURTENANT STRUCTURES, MIDDLE BRANCH, WESTFIELD, MASSACHUSETTS

NAME OF BIDDER *(Type or print)*

(Date)

TO: Division Engineer
U. S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

In compliance with the above-dated invitation for bids, the undersigned hereby proposes to perform all work for Construction of Littleville Dam and Appurtenant Structures, Middle Branch, Westfield, Massachusetts

in strict accordance with the General Provisions (Standard Form 23-A), Labor Standards Provisions Applicable to Contracts in Excess of $2,000 (Standard Form 19-A), specifications, schedules, drawings, and conditions, for the following amount(s)

See attached Unit Price Schedule

Affidavit made by the bidder concerning Parent Company and Employer Identification Number, attached hereto, forms a part of this bid.

Supplement to Bid Form, Sheets numbered 1 and 2, and Plant and Equipment Schedule, attached hereto form a part of this bid as does attached Unit Price Schedule.

The undersigned agrees that, upon written acceptance of this bid, mailed or otherwise furnished within ____ calendar days (60 calendar days unless a different period be inserted by the bidder) after the date of opening of bids, he will within 10 calendar days (unless a longer period is allowed) after receipt of the prescribed forms, execute Standard Form 23, Construction Contract, and give performance and payment bonds on Government standard forms with good and sufficient surety.

The undersigned agrees, if awarded the contract, to commence the work within
30 calendar days after the date of receipt of notice to proceed, and to complete the work within
* calendar days after the date of receipt of notice to proceed.

*For completion date or dates see Paragraph SC-1 of the specifications.

(Continue on other side)

Receipt of Amendments: The undersigned acknowledges receipt of the following amendments of the invitation for bids, drawings, and/or specifications, etc. *(Give number and date of each)*:

The bidder represents *(Check appropriate boxes)*:

(1) That he ☐ is, ☐ is not, a small business concern. *(For this purpose, a small business concern is a business concern, including its affiliates, which (a) is independently owned and operated, (b) is not dominant in its field of operation, and (c) had average annual receipts for the preceding three fiscal years not exceeding $5,000,000. For additional information see governing regulations of the Small Business Administration.)*

(2) (a) That he ☐ has, ☐ has not, employed or retained any company or person other than a full-time bona fide employee working solely for the bidder) to solicit or secure this contract, and (b) that he ☐ has, ☐ has not, paid or agreed to pay any company or person (other than a full-time bona fide employee working solely for the bidder) any fee, commission, percentage or brokerage fee, contingent upon or resulting from the award of this contract; and agrees to furnish information relating to (a) and (b) above as requested by the Contracting Officer.

(For interpretation of the representation, including the term "bona fide employee," see Code of Federal Regulations, Title 41, Subpart 1-1.5.)

(3) That he operates as an ☐ individual, ☐ partnership, ☐ joint venture, ☐ corporation, incorporated in State of .....

Enclosed is bid guarantee, consisting of

in the amount of

(with residental addresses)

NAME OF BIDDER *(Type or print)*	FULL NAME OF ALL PARTNERS *(Type or print)*
BUSINESS ADDRESS *(Type or print)*	
BY *(Signature in ink. Type or print name under signature)*	
TITLE *(Type or print)*	

DIRECTIONS FOR SUBMITTING BIDS

Envelopes containing bids, guarantee, etc., must be sealed, marked, and addressed as follows:

Division Engineer
U.S. Army Engineer Division, New England
424 Trapelo Road
Waltham 54, Mass.

Bids may be delivered in advance to the Bids Receiving Desk in Bldg. 109S at above address, or delivered directly to the Contracting Officer in Building 126 (Theater) just prior to the bid opening.

CAUTION: Bids should not be qualified by exceptions to the bidding conditions.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Excavation Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Drilling Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Concreting Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Material Handling Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Pumping Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Earth Embankment - Rolled Fills

Excavation and Transportation - Spreading and Rolling

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required.

PLANT AND EQUIPMENT SCHEDULE

Available Plant to be Used

Miscellaneous Equipment

No.	Type	Capacity	Manufacturer	Age & Condition	Location

Add additional sheets if required

UNIT PRICE SCHEDULE

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
1	Preparation of Site	1	Job	L.S.	$_____
2	Control and Diversion of Water	1	Job	L.S.	_____
* 3	Unclassified Excavation - General	330,000	C.Y.	$_____	_____
* 4	Unclassified Excavation-- Borrow Area "B"	1,700,000	C.Y.	_____	_____
* 5	Unclassified Excavation - Borrow Areas "C" and "E"	260,000	C.Y.	_____	_____
* 6	Rock Excavation - General	122,000	C.Y.	_____	_____
7	Rock Excavation - Tunnel	1,700	C.Y.	_____	_____
8	Rock Excavation - Shaft	560	C.Y.	_____	_____
* 9	Rock Excavation - Borrow	20,000	C.Y.	_____	_____
*10	Line Drilling	14,000	S.F.	_____	_____
11	Safety Mesh	6,000	S.Y.	_____	_____
12	Rock Bolting	50	Ea.	$16.00	_____
13	Machine Cleaned Bedrock Surfaces	32,000	S.Y.	$_____	_____
14	Hand Cleaned Bedrock Surfaces	8,100	S.Y.	_____	_____
15	Mortar for Foundation Preparation	200	C.F.	_____	_____
*16	Compacted Impervious Fill	1,375,000	C.Y.	_____	_____
17	Compacted Impervious Backfill	2,400	C.Y.	_____	_____
*18	Compacted Random Fill - Dike	40,000	C.Y.	_____	_____

*Estimated Quantities

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
*19	Compacted Random Fill - Dam and Miscellaneous	160,000	C.Y.	$____	$_____
20	Omitted				
*21	Compacted Pervious Fill	75,000	C.Y.	_____	_____
22	Compacted Gravel Backfill	2,500	C.Y.	_____	_____
23	Omitted				
*24	Compacted Gravel Fill	19,000	C.Y.	_____	_____
25	Omitted				
26	Omitted				
27	Omitted				
*28	Compacted Sand Fill	65,000	C.Y.	_____	_____
29	Compacted Processed Sand Fill	6,500	C.Y.	_____	_____
30	Omitted				
*31	Gravel Bedding	65,000	C.Y.	_____	_____
32	Road Gravel	9,200	C.Y.	_____	_____
33	Additional Rolling of Fill	1,000	Hrs.	_____	_____
34	Omitted				
35	Omitted				
*36	Rock Slope Protection	141,000	C.Y.	_____	_____
37	Selected Riprap	4,000	C.Y.	_____	_____
38	Rock Blanket	1,000	C.Y.	_____	_____

*Estimated Quantities

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
39	Tunnel Drilling and Grouting				
	a. Mobilization and Demobilization for Tunnel Drilling and Grouting	1	Job	$____	$____
	b. Drilling Grout Holes	460	L.F.	____	____
	c. Drilling Drain Holes	100	L.F.	____	____
	d. Drilling Exploratory Holes	100	L.F.	____	____
	e. Portland Cement in Grout	500	C.F.	____	____
	f. Sand in Grout	500	C.F.	____	____
	g. Placing Grout, Contact Grouting	740	C.F.	$4.00	____
	h. Placing Grout, Consolidation Grouting	260	C.F.	$____	____
	i. Connections to Grout Holes	25	Ea.	$5.00	____
40	Foundation Drilling and Grouting				
	a. Mobilization and Demobilization for Foundation Drilling and Grouting	1	Job	L.S.	____
	b. Drilling 1-1/2" (EX) Grout Holes	13,000	L.F.	$____	____
	c. Drilling 3" (NX) Drain Holes	3,000	L.F.	____	____
	d. Drilling 3" (NX) Exploratory Holes	200	L.F.	____	____
	e. Portland Cement in Grout	3,600	C.F.	____	____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
	f. Sand in Grout	100	C.F.	$____	$____
	g. Placing Grout	3,700	C.F.	____	____
	h. Connection to Grout Holes	800	Ea.	$5.00	____
41	Omitted				
42	Anchor Bars, Type A - 10' Setting	300	Ea.	$____	____
43	Omitted				
44	Anchor Bars, Type B - 10' Setting	320	Ea.	$____	____
45	Concrete - Gravity Walls, Spillway, and Flood Control Outlet Portal	3,900	C.Y.	____	____
46	Concrete-Lining Spillway and Flood Control Outlet Portal	1,170	C.Y.	____	____
47	Concrete - Spillway Weir	1,700	C.Y.	____	____
48	Concrete - Access Bridge Abutments	590	C.Y.	____	____
49	Concrete - Walls, Weir and Trash Bars, Flood Control Intake Structure	430	C.Y.	____	____
50	Concrete - Tunnel Lining	470	C.Y.	____	____
51	Concrete - Tunnel Transitions	460	C.Y.	____	____
52	Concrete - Flood Control Gate Shaft Lining to Elev. 564.5	350	C.Y.	____	____
53	Concrete - Flood Control Gate Shaft Lining from Elev. 564.5 to Elev. 579.0	90	C.Y.	____	____
54	Concrete - Flood Control Gate Shaft Superstructure	230	C.Y.	____	____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
55	Concrete - Water Supply Gravity Walls, Intake Channel and Outlet Portal	500	C.Y.	$____	$____
56	Concrete - Water Supply Diversion Conduit	3,700	C.Y.	____	____
56A	Concrete - Water Supply Outlet Lining	40	C.Y.	____	____
57	Concrete - Water Supply Intake Tower to Elev. 482	1,000	C.Y.	____	____
58	Concrete - Water Supply Intake Tower from Elev. 482 to Elev. 581	1,020	C.Y.	____	____
59	Concrete - Water Supply Intake Tower Superstructure above Elev. 581	250	C.Y.	____	____
60	Concrete - Service Bridge Abutment and Piers	2,000	C.Y.	____	____
61	Concrete - Bridge Superstructure	210	C.Y.	____	____
62	Tunnel Rib Supports	65	Ea.	____	____
63	Cement	30,000	Bbl.	____	____
64	Steel Reinforcement	840,000	Lb.	____	____
65	48-Inch Water Supply Pipe	1	Job	L.S.	____
66	Rubber Waterstop - Type A	1,420	L.F.	$____	____
67	Rubber Waterstop - Type B	50	L.F.	____	____
68	Flood Control Gate Shaft - Miscellaneous	1	Job	L.S.	____
69	Water Supply Intake Tower - Miscellaneous	1	Job	L.S.	____
70	Float Well and Accessories	1	Job	L.S.	____
71	Air Vent and Accessories	1	Job	L.S.	____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
72	Tile Gages	1	Job	L.S.	$_____
*73	Miscellaneous Metals	23,000	Lb.	$_____	_____
*74	Structural Steel-Miscellaneous	13,100	Lb.	_____	_____
75	Structural Steel Service Bridge	1	Job	L.S.	_____
76	Structural Steel - Access Bridge	1	Job	L.S.	_____
77	Aluminum	9,200	Lb.	$_____	_____
78	Heating and Ventilating Systems, Flood Control Operating House	1	Job	L.S.	_____
79	Gates and Accessories - Flood Control Gate Shaft	1	Job	L.S.	_____
80	Traveling Crane - Flood Control Operating House	1	Job	L.S.	_____
81	Diesel-Electric Generator Set	1	Job	L.S.	_____
82	Electrical Work, Interior, Flood Control Gate Shaft	1	Job	L.S.	_____
83	Heating System, Water Supply Intake Tower	1	Job	L.S.	_____
84	Gates and Accessories, Water Supply Intake Tower	1	Job	L.S.	_____
85	Traveling Crane - Water Supply Intake Tower	1	Job	L.S.	_____
86	Electrical Work, Interior, Water Supply Intake Tower	1	Job	L.S.	_____
87	Electrical Work, Exterior	1	Job	L.S.	_____
88	Cable Guard Rail	4,970	L.F.	$_____	_____
89	Guard Posts	24	Ea.	_____	_____

*Estimated Quantities

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
90	Chain Link Fencing, 4 Feet High	2,200	L.F.	$____	$_____
91	Precast Concrete Curb	370	L.F.	_____	_____
92	Flagpole	1	Job	L.S.	_____
93	Log Boom	1	Job	L.S.	_____
94	Bituminous Concrete Surfacing	8,520	S.Y.	$____	_____
95	Bituminous Surface Treatment	12,250	S.Y.	_____	_____
96	Utility Building	1	Job	L.S.	_____
97	Operators Quarters	1	Job	L.S.	_____
98	Garage	1	Job	L.S.	_____
99	Water Supply Wells				
	a. Mobilization and Demobilization for Water Supply Well No. 1	1	Job	L.S.	_____
	b. Mobilization and Demobilization for Water Supply Well No. 2	1	Job	L.S.	_____
	c. Driving 8" Outer Casing	110	L.F.	$____	_____
	d. Drilling 8" Hole Below 8" Casing	20	L.F.	_____	_____
	e. Setting 6" Inner Casing	120	L.F.	_____	_____
	f. Drilling 6" Hole, Uncased	370	L.F.	_____	_____
	g. Drilling 6" Hole, Uncased, below depth of 250 feet	200	L.F.	_____	_____
	h. Test Pumping Well	100	Hrs.	_____	_____

Item No.	Description	Quantity	Unit	Unit Price	Estimated Amount
100	Water Distribution System - Utility Building Area	1	Job	L.S.	$
101	Water Distribution System - Operators Quarters Area	1	Job	L.S.	
102	Sewage Disposal System - Utility Building Area	1	Job	L.S.	
103	Sewage Disposal System - Operators Quarters Area	1	Job	L.S.	
104	15-Inch Culvert	60	L.F.	$	
105	Class A Seedbed, Class A Seed	4,000	S.Y.		
106	Class B Seedbed, Class B Seed	19,000	S.Y.		
107	Class D Seedbed, Class B Seed	58,000	S.Y.		
			Total	$	

NOTE 1: The work will be awarded as a whole to one bidder.

NOTE 2: Only quantities for items with an asterisk adjacent to Item No. are estimated quantities. (See Par. SC-7 of the SPECIAL CONDITIONS)

NOTE 3: Funds for construction of the Operator's Quarters are limited due to Congressional limitations. In the event the combined price bid by the lowest responsible bidder for Items 97 and 98 exceed the limitations, the Government reserves the right to eliminate Items 97, 98 and 101 from the work to be awarded. Award will then be made on the basis of evaluation of all bidders with the above Items 97, 98, and 101 eliminated.

NOTE 4: The bidder shall indicate below the type of cement or combination of cements he proposes to furnish (see Paragraph 14-02). One option only will be elected.

Portland cement	☐
Blend of natural cement and portland cement	☐
Portland blast furnace slag cement	☐

A F F I D A V I T

PARENT COMPANY AND EMPLOYER IDENTIFICATION NUMBER.

(a) Bidder represents that he /__/is, /__/is not, owned or controlled by a parent company. For this purpose a parent company is defined as one which either owns or controls the activities and basic business policies of the bidder. To own another company means the parent company must own at least a majority (more than 50 percent) of the voting rights in that company. To control another company such ownership is not required; if another company is able to formulate, determine or veto basic business policy decisions of the bidder such other company is considered the parent of the bidder. This control may be exercised through the use of dominant minority voting rights, use of proxy voting, contractual arrangements, or otherwise.

(b) If bidder is owned or controlled by a parent company, insert in the space below the name and main office address of the parent company.

_____ _____

Name Address

(c) Bidder will provide in the applicable space below, if he has no parent company, his own Employer's Identification Number (E. I. No.) (Federal Social Security Identification Number used on Federal Tax Returns), or, if he has a parent company, the E. I. No. of his parent company.

Bidder's E. I. No._____

Parent Company's E. I. No._____

SUPPLEMENT TO BID FORM
(Construction Contract)

If a bid or modification to a bid based on unit prices is submitted and provides for a lump sum adjustment to the total estimated cost, the application of the lump sum adjustment to each unit price, including lump sum units, in the bid schedule must be stated or, if it is not stated, the bidder agrees that the lump sum adjustment shall be applied on a prorata basis to every unit price in the bid schedule.

In case of error in the extension of prices, the unit price will govern.

The bidder warrants that he has available or under his control plant of the character and in the amount required to complete the proposed work within the specified time.

It is hereby warranted that in the event award is made to the bidder, there will be furnished under this contract, or used in the performance of the work covered by this contract, only such unmanufactured articles, materials, and supplies as have been mined or produced in the United States and only such manufactured articles, materials, and supplies as have been manufactured in the United States substantially all from articles, materials, or supplies mined, produced or manufactured, as the case may be, in the United States, except as noted below or otherwise indicated in this bid or authorized in the invitation.

Mistakes in Bids. - The bidder hereby waives that portion of any alleged mistake or mistakes in his bid which falls within the following amounts:

If bid is $250,000 or less -- 5% of the bid;

If bid is more than $250,000 and less than $500,000 -- $12,500 plus 4% of the bid over $250,000;

If bid is $500,000 or more, and less than $1,000,000 -- $22,500 plus 3% of the bid over $500,000;

If bid is $1,000,000 or more -- $37,500 plus 2% of the bid over $1,000,000.

In cases where the allegation of mistake exceeds the above waived amounts and the request for correction is allowed, such amount will be excluded from the contract price; however, the amount waived as provided herein will not be deducted for the purpose of evaluating bids to determine the low bidder.

SUPPLEMENT TO BID FORM
(Construction Contract)

The above waiver does not apply to any clerical mistake which is obvious or apparent on the face of the bid including but not limited to (1) a mistake in the extension of a unit price or prices; (2) a mistake in totaling the sums of various bid items; (3) obviously misplaced decimal point or (4) failure to insert the unit price where amount intended can be determined from face of bid.

This clause is not applicable to allegations of mistakes which, if allowed, would result in a reduction in the bid price.

PART I

GENERAL CONDITIONS
(Index)

Paragraph No.	Paragraph Title	Page No.
GC-1	Scope of Work	GC-1
GC-2	Character of Work and Mechanics	GC-1
GC-3	Site Investigation	GC-1
GC-4	Operations and Storage Areas	GC-1
GC-5	Progress Charts, and Requirements for Overtime Work	GC-2
GC-6	Subcontractors	GC-3
GC-7	Quality of Articles, Materials and Equipment	GC-3
GC-8	Protection of Material and Work	GC-4
GC-9	Protection of Existing Structures, Utilities, Work and Vegetation	GC-4
GC-10	Possession Prior to Completion	GC-4
GC-11	Reserved	
GC-12	Labor Reports	GC-5
GC-13	Cleaning Up	GC-5
GC-14	Definitions	GC-5
GC-15	Bonds	GC-6
GC-16	Accident Prevention	GC-6
GC-17	Inspection	GC-7
GC-18	Items of Work	GC-7

PART I

GENERAL CONDITIONS

GC-1. SCOPE OF WORK. - The work to be performed under this contract consists of furnishing all plant, materials, equipment, supplies, labor and transportation, including fuel, power, water (except any materials, equipment, utility or service, if any, specified herein to be furnished by the Government), and performing all work as required in the statement of work in the contract, in strict accordance with the specifications, schedules, and drawings, all of which are made a part hereof, and including such detail drawings as may be furnished by the Contracting Officer from time to time during the prosecution of the work in explanation of said drawings.

GC-2. CHARACTER OF WORK AND MECHANICS. - The work shall be executed in the best and most workmanlike manner by qualified, careful and efficient mechanics in strict accordance with the drawings and specifications.

GC-3. SITE INVESTIGATION. - The contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government as well as from information presented by the drawings and specifications made a part of this contract. Any failure by the contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Government assumes no responsibility for any conclusions or interpretations made by the contractor on the basis of the information made available by the Government. The Government also assumes no responsibility for any understanding or representations made by its officers or agents during or prior to the execution of this contract, unless (i) such understanding or representations are expressly stated in the contract and (ii) the contract expressly provides that the responsibility therefor is assumed by the Government. Representations which are not expressly stated in the contract and for which liability is not expressly assumed by the Government in the contract shall be deemed only for the information of the contractor.

GC-4. OPERATIONS AND STORAGE AREAS. - a. All operations of the contractor (including storage of materials) upon Government premises shall be confined to areas authorized or approved by the Contracting

Officer. No unauthorized or unwarranted entry upon or passage through, or storage or disposal of materials shall be made upon Government premises. Government premises adjacent to the construction will be made available for use by the contractor without cost whenever such use will not interfere with other Government uses or purposes. The contractor shall be liable for any and all damage caused by him to such Government premises. The contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature or kind arising from any use, trespass or damage occasioned by his operations on premises of third persons.

b. Temporary buildings (storage sheds, shops, offices, etc.), may be erected by the contractor only with the approval of the Contracting Officer, and shall be built with labor and materials furnished by contractor without expense to the Government. Such temporary buildings and/or utilities shall remain the property of the contractor and will be removed by him at his expense upon the completion of the work. With the written consent of the Contracting Officer, such buildings and/or utilities may be abandoned and need not be removed.

c. The contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways or construct and use such temporary roadways as may be authorized by the Contracting Officer. Where materials are transported in the prosecution of the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, state or local law or regulation. When it is necessary to cross curbings or sidewalks, protection against damage shall be provided by the contractor and any damaged roads, curbings, or sidewalks shall be repaired by, or at the expense of the contractor.

GC-5. PROGRESS CHARTS, AND REQUIREMENTS FOR OVERTIME WORK. - a. The contractor shall within 5 days or within such time as determined by the Contracting Officer, after date of commencement of work, prepare and submit to the Contracting Officer for approval a practicable schedule, showing the order in which the contractor proposes to carry on the work, the date on which he will start the several salient features (including procurement of materials, plant and equipment) and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time. The contractor shall enter on the chart the actual progress at the end of each week or at such intervals as directed by the Contracting Officer, and shall immediately deliver to the Contracting Officer three copies thereof.

b. If, in the opinion of the Contracting Officer, the contractor falls behind the progress schedule, the contractor shall take such steps as may be necessary to improve his progress and the Contracting Officer may require him to increase the number of shifts, and/or

overtime operations, days of work, and/or the amount of construction plant, and to submit for approval such supplementary schedule or schedules in chart form as may be deemed necessary to demonstrate the manner in which the agreed rate of progress will be regained, all without additional cost to the Government.

c. Failure of the contractor to comply with the requirements of the Contracting Officer under this provision shall be grounds for determination by the Contracting Officer that the contractor is not prosecuting the work with such diligence as will insure completion within the time specified. Upon such determination, the Contracting Officer may terminate the contractor's right to proceed with the work, or any separable part thereof, in accordance with the delays-damages article of the contract.

GC-6. SUBCONTRACTORS. - Within 7 days after the award of any subcontract either by himself or a subcontractor, the contractor shall deliver to the Contracting Officer a statement setting forth the name and address of the subcontractor and a summary description of the work subcontracted. The contractor shall, at the same time, furnish a statement signed by the subcontractor acknowledging the inclusion in his subcontract of Clause 21 of Standard Form 23A and all clauses set forth in Standard Form 19A. If, for sufficient reason, at any time during the progress of the work, the Contracting Officer determines that any subcontractor is incompetent or undesirable, he will notify the contractor accordingly and steps will be taken immediately for cancellation of such subcontract. Subletting by subcontractors shall be subject to the same regulations. Nothing contained in this contract shall create any contractual relation between the subcontractor and the Government.

GC-7. QUALITY OF ARTICLES, MATERIALS AND EQUIPMENT. - a. Where articles, materials and equipment are required to conform to standard specifications or tests of the Government or other authorities incorporated by reference, they will conform to the respective editions, including amendments, specified.

b. Any samples and descriptive data required shall -

(1) Be submitted within the time specified in these specifications or, if not specified, within a reasonable time before use to permit inspection and testing.

(2) Be shipped prepaid and delivered as specified in these specifications, or as directed by the Contracting Officer.

(3) Be marked to show the name of the material, trade name of manufacturer, place of origin, name and location of the project where the material represented by the sample is to be used, and the name of the contractor submitting the sample.

c. Samples not subjected to destructive tests may be retained until completion of the work but thereafter will be returned to the contractor, if he so requests in writing, at his own expense. Failure of any sample to pass the specified requirements will be sufficient cause for refusal to consider further any samples from the same manufacturer whose materials failed to pass the tests.

GC-8. PROTECTION OF MATERIAL AND WORK. - The contractor shall at all times protect and preserve all materials, supplies and equipment of every description (including property which may be Government-furnished or owned) and all work performed. All reasonable requests of the Contracting Officer to inclose or specially protect such property shall be complied with. If, as determined by the Contracting Officer, material, equipment, supplies and work performed are not adequately protected by the contractor such property may be protected by the Government and the cost thereof may be charged to the contractor or deducted from any payments due to him.

GC-9. PROTECTION OF EXISTING STRUCTURES, UTILITIES, WORK AND VEGETATION. - a. Any damage to existing structures or work of any kind, or the interruption of a utility service resulting from failure to comply with the requirements of this contract shall be repaired or restored promptly by or at the expense of the contractor.

b. The contractor will preserve and protect all existing vegetation such as trees, shrubs, and grass on or adjacent to the site which do not unreasonably interfere with the construction as may be determined by the Contracting Officer. The contractor will be responsible for all unauthorized cutting or damaging of trees and shrubs, including damage due to careless operation of equipment, stockpiling of materials or tracking of grass areas by equipment.

c. Care will be taken by the contractor in felling trees authorized for removal to avoid any unnecessary damage to vegetation that is to remain in place. Any limbs or branches of trees broken during such operations, shall be trimmed with a clean cut and painted with an approved tree pruning compound if required by the Contracting Officer. The contractor will be liable for or may be required to replace or restore at his own expense all vegetation not protected and preserved as required herein that may be destroyed or damaged.

GC-10. POSSESSION PRIOR TO COMPLETION. - The Government shall have the right to take possession of or use any completed or partially completed part of the work. Such possession or use shall not be deemed an acceptance of any work not completed in accordance with the contract.

If such prior possession or use by the Government delays the progress of the work or causes additional expenses to the contractor, an equitable adjustment in the contract price and/or the time of completion will be made and the contract shall be modified in writing accordingly.

GC-11. RESERVED

GC-12. LABOR REPORTS. - The contractor shall promptly furnish, and shall cause any subcontractors to furnish in like manner, within 7 days after the regular payment date of each weekly payroll, to the Contracting Officer, a copy of such payroll together with a statement of compliance with respect to the wages paid each of its employees (which shall not be deemed to apply to persons in classifications higher than laborers and mechanics and those who are the immediate supervisors of such employees) engaged on the work. If the contractor or any of his subcontractors fails to furnish copies of such payrolls, the Contracting Officer may disapprove all or part of any progress payment estimate for the period covered by such payrolls until they are received by him. The contractor shall also prepare and furnish such labor reports as may be required by the Department of Labor.

GC-13. CLEANING UP. - The contractor shall, at all times, keep the construction area, including storage areas used by him, free from accumulations of waste material or rubbish and prior to completion of the work remove any rubbish from the premises and all tools, scaffolding, equipment, and materials not the property of the Government. Upon completion of the construction, the contractor shall leave the work and premises in a clean, neat and workmanlike condition satisfactory to the Contracting Officer.

GC-14. DEFINITIONS. - a. Wherever in the specifications or upon the drawings the words directed, required, ordered, designated, prescribed, or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation or prescription of the Contracting Officer is intended and similarly the words approved, acceptable, satisfactory or words of like import shall mean approved by, or acceptable to, or satisfactory to the Contracting Officer, unless otherwise expressly stated.

b. Basic rate as used in Clause 2, "Eight-Hour Laws - Overtime Compensation", of Standard Form 19A means the basic hourly straight time wage rate actually paid laborers and mechanics and is not necessarily the same as the minimum hourly rate referred to in Clause 1, "Davis-Bacon

Act" of Standard Form 19A and in the paragraph of the specifications entitled "Rates of Wages".

GC-15. BONDS. - a. Payment Bond. - If the contract exceeds $2,000, the contractor agrees to furnish a payment bond with good and sufficient surety or sureties acceptable to the Government for the protection of persons furnishing material or labor in connection with the performance of the work under this agreement on U. S. Standard Form No. 25-A or U. S. Standard Form No. 27-A. The penal sum of such payment bond will be as follows: (1) When the contract price is $1,000,000 or less, 50 percent of the contract price; (2) When the contract price is in excess of $1,000,000, but no more than $5,000,000, 40 percent of the contract price; (3) When the contract price is more than $5,000,000, $2,500,000.

b. Performance Bond. - If the contract price exceeds $2,000, the contractor further agrees to furnish a performance bond with good and sufficient surety or sureties acceptable to the Government in connection with the performance of the work under this agreement on U. S. Standard Form No. 25 or U. S. Standard Form No. 27. The penal sum of such performance bond will be 100 percent of the contract price.

c. Any bonds required hereunder will be dated as of the same date as the contract and will be furnished by the contractor to the Government at the time the contract is executed.

GC-16. ACCIDENT PREVENTION. - a. In order to provide safety controls for protection to the life and health of employees and other persons; for prevention of damage to property, materials, supplies, and equipment; and for avoidance of work interruptions in the performance of this contract; the contractor will comply with all pertinent provisions of Corps of Engineers Manual, EM 385-1-1, dated 13 March 1958, entitled "General Safety Requirements," as amended, and will also take or cause to be taken such additional measures as the Contracting Officer may determine to be reasonably necessary for the purpose.

b. Prior to commencement of work, the contractor will -

(1) Submit in writing his proposals for effectuating this provision for Accident Prevention.

(2) Meet in conference with representative of the Contracting Officer to discuss and develop mutual understandings relative to administration of the over-all safety program.

c. During the performance of work under the contract, the contractor shall comply with all procedures prescribed by the Contracting

Officer for the control and safety of persons visiting the job site and will comply with such requirements to prevent accidents as may be specified under the SPECIAL CONDITIONS of these specifications or issued by the Contracting Officer.

d. The contractor will maintain an accurate record of, and will report to the Contracting Officer in the manner and on the forms prescribed by the Contracting Officer, exposure data and all accidents resulting in death, traumatic injury, occupational disease, and/or damage to property, materials, supplies and equipment incident to work performed under this contract.

e. The Contracting Officer will notify the contractor of any non-compliance with the foregoing provisions and the action to be taken. The contractor shall, after receipt of such notice, immediately take corrective action. Such notice, when delivered to the contractor or his representative at the site of the work, shall be deemed sufficient for the purpose. If the contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop order shall be made the subject of claim for extension of time or for excess costs or damages by the contractor.

f. Compliance with the provisions of this article by subcontractors will be the responsibility of the contractor.

GC-17. INSPECTION. - The work will be conducted under the general direction of the Contracting Officer and is subject to inspection by his appointed inspectors to insure strict compliance with the terms of the contract. No inspector is authorized to change any provision of the specifications without written authorization of the Contracting Officer, nor shall the presence or absence of an inspector relieve the contractor from any requirements of the contract. As soon as practicable after the completion of the entire work, or any divisible part thereof as may be designated in these specifications, a thorough examination thereof will be made by the Contracting Officer at the site of the work. If such work is found to comply fully with the requirements of the contract, it will be accepted; and final payment therefor will be made in accordance with the article of the contract entitled "Payments to Contractors."

GC-18. ITEMS OF WORK. - A brief description of each item and the estimated quantity thereof are shown in the schedule attached to the Bid Form and listed in the Statement of Work in the contract. Unless otherwise provided in the SPECIAL CONDITIONS, within the limit of available funds, the contractor will be required to complete the work specified herein in accordance with the contract and at the contract price or prices.

PART II

SPECIAL CONDITIONS
(Index)

Paragraph No.	Paragraph Title	Page No.
SC-1	Commencement, Prosecution and Completion of Work	SC-1
SC-2	Omitted	
SC-3	Contract Drawings and Specifications	SC-1
SC-4	Shop Drawings	SC-6
SC-5	Physical Data	SC-6
SC-6	Rates of Wages	SC-8
SC-7	Variations in Estimated Quantities	SC-9
SC-8	Government-Furnished Property	SC-10
SC-9	Omitted	
SC-10	Water	SC-10
SC-11	Electricity	SC-10
SC-12	Omitted	
SC-13	Layout of Work and Surveys	SC-11
SC-14	Payments for Mobilization and Preparatory Work	SC-12
SC-15	Damage to Work	SC-12
SC-16 to SC-23, Incl	Omitted	
SC-24	Funds Available for Payments	SC-13
SC-25 & SC-26	Omitted	
SC-27	Additional Supervision of Subcontracted Work	SC-15
SC-28	Scheduling and Determination of Progress	SC-15

Paragraph No.	Paragraph Title	Page No.
SC-29	Time Extensions	SC-16
SC-30	Reverse Signal Alarms	SC-16
SC-31	Omitted	
SC-32	Safety Nets	SC-16
SC-33	Performance of Work by Contractor	SC-17
SC-34	Contract Bid Breakdown	SC-17
SC-35	Temporary Heat	SC-17
SC-36	Omitted	
SC-37	Soils and Materials Control	SC-17
SC-38	Construction Sign	SC-18
SC-39	Safety Sign	SC-18
SC-40	Accident Prevention	SC-18
SC-41	Spare Parts Data	SC-19
SC-42	Guarantee	SC-20
SC-43	Operator's Quarters	SC-20
SC-44	Identification of Mechanized Equipment	SC-20
SC-45	Omitted	
SC-46	Project Bulletin Board	SC-20
SC-47	Certificates	SC-21
SC-48 & SC-49	Omitted	
SC-50	Deviations from Contract Requirements	SC-21
SC-51	Contractor's Options	SC-22
SC-52	Concrete Aggregate -- Approved Sources	SC-22
SC-53	Factors Affecting the Prosecution of the Work	SC-23
SC-54	Warning Signs	SC-23
SC-55	Plant	SC-23
SC-56	Blasting	SC-24

PART II

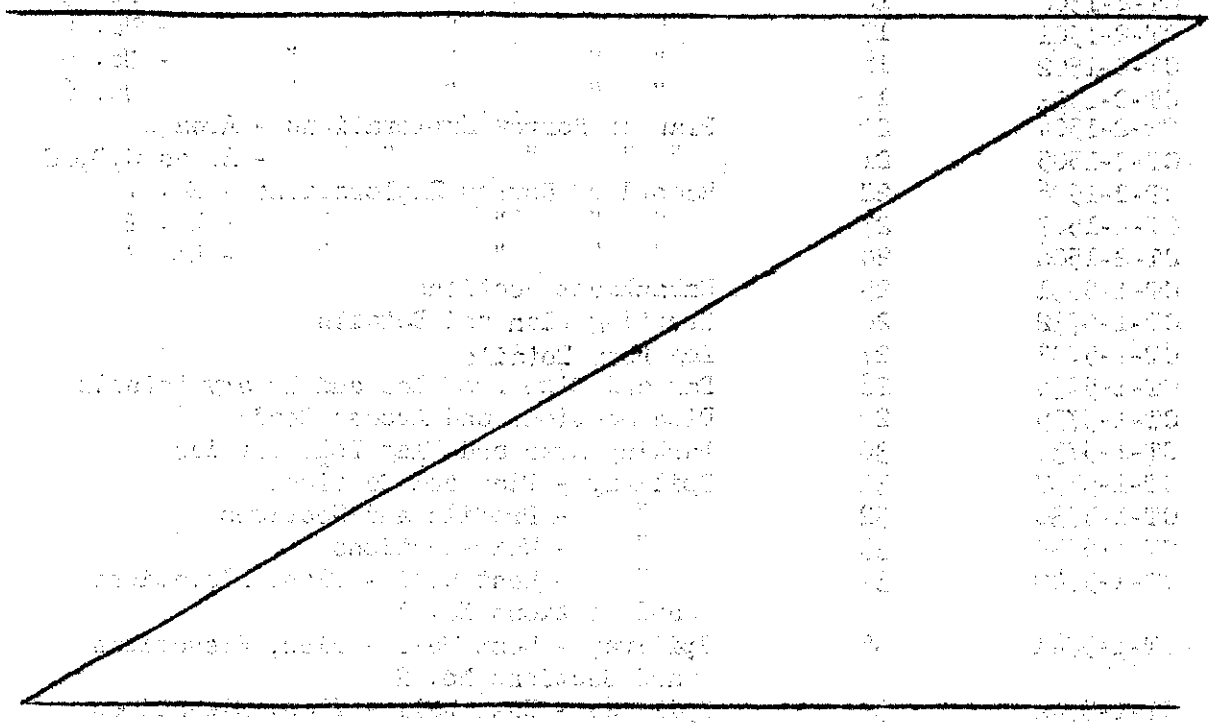
SPECIAL CONDITIONS

SC-1. COMMENCEMENT, PROSECUTION AND COMPLETION OF WORK. - a. The contractor will be required to commence work under this contract within 30 calendar days after the date of receipt by him of notice to proceed, to prosecute said work with faithfulness and energy, and to complete the entire work ready for use not later than 900 calendar days after date of receipt by him of notice to proceed. The time stated for completion shall include final clean-up of the premises.

b. Time Extension for Topsoiling and Seeding. - In the event the contract completion date, as established in Subparagraph "a" above, is thirty (30) days or more after the limiting date established for seeding in the Technical Provisions herein, the contract completion date for topsoiling and seeding will be the last date of the next succeeding period specified as acceptable for seeding.

SC-2. OMITTED.

SC-3. CONTRACT DRAWINGS AND SPECIFICATIONS. - Twenty sets of contract drawings and specifications will be furnished the contractor without charge. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the following contract drawings and maps, all of which form a part of these specifications and are available in the office of the U. S. Army Engineer Division, New England Division, 424 Trapelo Road, Waltham, Massachusetts.



Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5724	1	Project Plan and Index	
CT-1-5725	2	General Plan	
CT-1-5726	3	Hydrograph No. 1	
CT-1-5727	4	Hydrograph No. 2	
CT-1-5728	5	Hydrograph No. 3	
CT-1-5729	6	Hydrograph No. 4	
CT-1-5730	7	Hydrograph No. 5	
CT-2-1492	8	Plan of Foundation Explorations	
CT-2-1493	9	Dam & Dike - Geologic Sections	
CT-2-1494	10	Cut-Off Trench - Geologic-Log Section	
CT-2-1495	11	Water Supply Outlet Works - Geologic-Log Sections	
CT-2-1496	12	Flood Control Outlet Works - Geologic-Log Sections	
CT-2-1497	13	Spillway - Geologic-Log Sections	
CT-2-1498	14	Record of Foundation Explorations - No. 1	
CT-2-1499	15	" " " " - No. 2	
CT-2-1500	16	" " " " - No. 3	
CT-2-1501	17	" " " " - No. 4	
CT-2-1502	18	" " " " - No. 5	
CT-2-1503	19	" " " " - No. 6	
CT-2-1504	20	Plan of Borrow Explorations - Area B	
CT-2-1505	21	" " " " - Areas C,D,&E	
CT-2-1506	22	Record of Borrow Explorations - No. 1	
CT-2-1507	23	" " " " - No. 2	
CT-2-1508	24	" " " " - No. 3	
CT-1-5731	25	Embankment Sections	
CT-1-5732	26	Grouting Plan and Details	
CT-1-5733	27	Log Boom Details	
CT-1-5734	28	Dam and Dike Profiles and Rotary Details	
CT-1-5735	29	Dike Sections and Access Road	
CT-1-5736	30	Parking Area and Flag Pole Details	
CT-1-5737	31	Spillway - Plan and Sections	
CT-1-5738	32	" - Profile and Sections	
CT-1-5739	33	" - Weir-Sections	
CT-1-5740	34	" - West Wall - Plan, Elevations and Sections No. 1	
CT-1-5741	35	Spillway - West Wall - Plan, Elevations and Sections No. 2	
CT-1-5742	36	Spillway - East Wall - Plan, Elevations and Sections	
CT-1-5743	37	Spillway - East Retaining Wall - Plan, Elevations and Sections	
CT-1-5744	38	Flood Control Outlet Works - Plan and Profile	
CT-1-5745	39	Flood Control Intake Structure - Concrete Stairs	

Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5746	40	Flood Control Intake Structure - Plan, Section and Detail	
CT-1-5747	41	Flood Control Intake Structure - Sections and Reinforcing Details No. 1	
CT-1-5748	42	Flood Control Intake Structure - Reinforcing Details No. 2	
CT-1-5749	43	Flood Control Tunnel and Transition - Sections and Reinforcing Details	
CT-1-5750	44	Flood Control Gate Shaft - Architectural - Plans and Elevations	
CT-1-5751	45	Flood Control Gate Shaft - Architectural - Sections and Details	
CT-1-5752	46	Flood Control Gate Shaft - Architectural - Entrance Details	
CT-1-5753	47	Flood Control Gate Shaft & Water Supply Tower - Architectural - Miscellaneous Details	
CT-1-5754	48	Flood Control Gate Shaft - Structural - Roof and Operating Floor Slabs - Reinforcing Details	
CT-1-5755	49	Flood Control Gate Shaft - Structural - Basement Floor Slab - Reinforcing Details	
CT-1-5756	50	Flood Control Gate Shaft - Structural - Superstructure - Elevations and Sections - Reinforcing Details	
CT-1-5757	51	Flood Control Gate Shaft - Structural - Platform, Stairs and Air Vent - Reinforcing Details	
CT-1-5758	52	Flood Control Gate Shaft - Structural - Vertical and Horizontal Sections - Reinforcing Details	
CT-1-5759	53	Flood Control Outlet Works - Structural - Miscellaneous Metals Details	
CT-1-5760	54	Flood Control Gate Shaft - Air Vents and Accessories	
CT-1-5761	55	Flood Control Gate Shaft - Mechanical - Plans, Sections and Details	
CT-1-5762	56	Flood Control Gate Shaft - Mechanical - Gate Assembly & Miscellaneous Details	
CT-1-5763	57	Flood Control Gate Shaft - Electrical - Plans and Section	
CT-1-5764	58	Flood Control Outlet Portal - Plan and Sections	
CT-1-5765	59	Flood Control Outlet Portal - Sections	
CT-1-5766	60	Water Supply - Plan and Profile	

Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5767	61	Water Supply Intake Tower - Plan and Sections	
CT-1-5768	62	Water Supply Intake Tower - Retaining Walls	
CT-1-5769	63	Water Supply Intake Tower - Architectural - Plans and Details	
CT-1-5770	64	Water Supply Intake Tower - Architectural - Elevation and Section	
CT-1-5771	65	Water Supply Intake Tower - Architectural - Entrance Details	
CT-1-5772	66	Water Supply Intake Tower - Structural - Roof and Operating Floor Slabs - Reinforcing Details	
CT-1-5773	67	Water Supply Intake Tower - Structural - Heater Room and Gate Well Floor Slabs - Reinforcing Details	
CT-1-5774	68	Water Supply Intake Tower - Structural - Superstructure - Elevations and Sections - Reinforcing Details	
CT-1-5775	69	Water Supply Intake Tower - Structural - Platform and Stairs - Reinforcing Details	
CT-1-5776	70	Water Supply Intake Tower - Structural - Base Slab and Wall - Reinforcing Details	
CT-1-5777	71	Water Supply Intake Tower - Structural - Vertical Section No. 1	
CT-1-5778	72	Water Supply Intake Tower - Structural - Vertical Section No. 2	
CT-1-5779	73	Water Supply Intake Tower and Flood Control Gate Shaft - Structural - Miscellaneus Metals - Details No. 2	
CT-1-5780	74	Water Supply Intake Tower and Flood Control Gate Shaft - Structural - Miscellaneous Metals - Details No. 2	
CT-1-5781	75	Water Supply Intake Tower - Mechanical - Plans and Sections	
CT-1-5782	76	Water Supply Intake Tower - Mechanical - Gate Assemblies & Miscellaneous Details	
CT-1-5783	77	Water Supply Intake Tower - Electrical - Plans and Sections	
CT-1-5784	78	Water Supply Intake Tower - Float Well and Accessories	
CT-1-5785	79	Water Supply Intake Tower - Tile Gages	
CT-1-5786	80	Water Supply Conduit - Plan and Sections No. 1	
CT-1-5787	81	Water Supply Conduit - Plan and Sections No. 2	
CT-1-5788	82	Water Supply Conduit - Plan and Sections No. 3	
CT-1-5789	83	Water Supply Outlet Portal - Plan and Sections	

Drawing No.	Sheet No.	Title	Rev. No.
CT-1-5790	84	Electrical Distribution System - Plan and One Line Diagram	
CT-1-5791	85	Electrical Distribution System - Miscellaneous Details No. 1	
CT-1-5792	86	Electrical Distribution System - Miscellaneous Details No. 2	
CT-1-5793	87	Access Bridge Abutments - Plan and Details	
CT-1-5794	88	Access Bridge - Structural Steel Details No. 1	
CT-1-5795	89	" " - " " " No. 2	
CT-1-5796	90	Access and Service Bridges - Structural - Bearing and Abutment Details	
CT-1-5797	91	Service Bridge - Structural Steel Details No. 1	
CT-1-5798	92	Service Bridge - Structural Steel Details No. 2	
CT-1-5799	93	Service Bridge - Structural - Piers and Abutment Details	
CT-1-5800	94	Goss Hill Road Improvement - Plan and Profile No. 1	
CT-1-5801	95	Goss Hill Road Improvement - Plan and Profile No. 2	
CT-1-5802	96	Goss Hill Road Improvement - Plan and Profile No. 3	
CT-1-5803	97	Goss Hill Road Improvement - Plan and Profile No. 4	
CT-1-5804	98	Maintenance Road - Profile, Sections and Details	
CT-1-5805	99	Utility Building - Site Plan	
CT-1-5806	100	Utility Building - Plans, Sections and Details	
CT-1-5807	101	Utility Building - Elevations and Details	
CT-1-5808	102	" " - Sections and Details	
CT-1-5809	103	" " - Structural Details	
CT-1-5810	104	" " - Plumbing and Heating	
CT-1-5811	105	" " - Electrical	
CT-1-5812	106	Operators Quarters - Site Plan	
CT-1-5813	107	Operators Quarters - Floor Plans, Elevation and Sections	
CT-1-5814	108	Operators Quarters - Framing Plans, Sections and Details	
CT-1-5815	109	Operators Quarters - Electrical Plan	
CT-1-5816	110	Operators Quarters - Plumbing and Heating	
CT-1-5817	111	Garage - Plans, Elevations, Sections and Details	

SC-4. SHOP DRAWINGS. - The contractor shall submit to the Contracting Officer for approval six (6) copies of all shop drawings as called for under the various headings of these specifications. These drawings shall be complete, shall be checked by the contractor prior to submission, and shall contain all required detailed information. If approved by the Contracting Officer, each copy of the drawings will be identified as having received such approval by being so stamped and dated. The contractor shall make any corrections required by the Contracting Officer. Four (4) sets of all shop drawings will be retained by the Contracting Officer and two sets will be returned to the contractor. The approval of the drawings by the Contracting Officer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the contractor of the responsibility for any error which may exist, as the contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work. The submission by the contractor will be accompanied by ENG Form 4025, in sextuplicate. In addition, an information copy of this form, without inclosures, will be forwarded by the contractor to the Resident Engineer, Area Engineer, and Design Branch, Engineering Division, NED. ENG Form 4025 will be furnished to the contractor by the Government.

SC-5. PHYSICAL DATA. - Information and data furnished or referred to below are furnished for information only and it is expressly understood that the Government will not be responsible for any interpretation or conclusion drawn therefrom by the contractor.

a. The physical conditions indicated on the drawings and in the specifications are the result of site investigations by surveys and borings, test pits and foundation probes. Soil samples and rock cores obtained from the subsurface explorations made by the Government, field reports of explorations, records of water levels in observation wells, and results and data of all tests made by the Government on soil samples are available for examination and review at the Corps of Engineers Soils, Foundations and Frost Effects Laboratory, New England Division Headquarters, 424 Trapelo Road, Waltham, Mass. telephone TWinbrook 4-2400, Ext. 387. The results of laboratory tests, except those of permeability test, performed on soil samples obtained from subsurface explorations in the foundation areas of the embankments and structures are shown on Plate Nos. A-1 through A-18A (19 sheets), inclusive, inserted at the end of the SPECIAL CONDITIONS. The classification of soil samples is in accordance with Drawing No. NEDGL-61-5C, "Unified Soil Classification", attached at the end of the SPECIAL CONDITIONS.

b. Weather Conditions. - Weather conditions at the site of the work are approximately as indicated below. Complete weather records and reports may be obtained from the U. S. Weather Bureau. On the basis of records, the following weather information is listed for the convenience of the contractor.

Monthly Temperatures

(Degrees Fahrenheit)
Knightville Dam, Mass.
Elev. 630 ft. m.s.l.
Period of Record - 11 yrs.

Month	Mean	Maximum	Minimum
January	23.7	60	-24
February	26.2	63	-16
March	32.6	69	-14
April	45.6	84	10
May	55.3	90	23
June	64.9	99	32
July	70.1	99	40
August	67.2	100	38
September	59.0	100	24
October	49.8	88	17
November	38.0	81	2
December	27.7	61	-19
Annual	46.7	100	-24

Monthly Precipitation
(Depth in Inches)

Month	Knightville Dam Elev. 630 ft. m.s.l. Period of Record - 19 yrs.			Chester, Mass. Elev. 600 ft. m.s.l. Period of Record - 44 yrs.		
	Mean	Max.	Min.	Mean	Max.	Min.
January	3.15	6.40	0.75	3.53	6.83	0.91
February	2.75	4.67	1.24	3.16	5.18	1.69
March	4.00	10.18	1.28	3.91	10.49	0.21
April	3.69	5.73	0.82	3.83	8.37	0.75
May	3.99	6.73	0.95	3.93	7.77	1.15
June	3.21	6.23	0.57	4.11	9.15	0.23
July	3.80	7.33	1.12	3.99	8.49	1.01
August	3.41	15.27	1.15	3.99	18.44	0.50
September	3.57	8.06	1.38	3.94	12.61	0.40
October	3.65	16.95	1.19	3.65	17.51	0.00
November	4.53	7.18	0.81	4.37	11.01	1.00
December	3.80	6.21	0.65	3.59	9.19	0.76
Annual	43.92	62.26	32.15	45.90	67.50	32.23

Mean Monthly Snowfall
(Average Depth in Inches)

Month	Knightville Dam Period of Record - 12 yrs.	Chester, Mass. Period of Record - 20 yrs.
January	12.00	13.34
February	12.55	14.14
March	13.47	10.16
April	4.63	1.92
May	0	0
June	0	0
July	0	0
August	0	0
September	0	0
October	0	0
November	2.16	4.15
December	6.75	8.95
Annual	51.56	52.66

c. Transportation Facilities. - (1) U. S. Route 20 and State Route 112 pass through the town of Huntington. (Huntington is approximately 2-1/2 miles south of the project site). U. S. Route 20 connects with the Massachusetts Turnpike (Exit 6) approximately 10 miles south of Huntington. Local and town roads provide access to project site.

(2) It will be the responsibility of the contractor to make his own investigation of transportation facilities including railroads and public roads and private lands and make his own arrangement for their use.

SC-6. RATES OF WAGES. - a. The minimum wages to be paid laborers and mechanics on this project, as determined by the Secretary of Labor to be prevailing for the corresponding classes of laborers and mechanics employed on projects of a character similar to the contract work in the pertinent locality, are as set forth below.

b. Any class of laborers and mechanics not listed below employed on this contract shall be classified or reclassified conformably to the schedule set out below by mutual agreement between the contractor and class of labor concerned, subject to the prior approval of the Contracting Officer. In the event the interested parties cannot agree on the proper classification or reclassification of a particular class of laborers and mechanics to be used, the question, accompanied by the recommendation of the Contracting Officer, shall be referred to the Secretary of Labor for final determination.

MINIMUM RATES OF WAGES FOR THIS PROJECT AS DETERMINED BY THE SECRETARY OF LABOR WILL BE INCORPORATED INTO THE SPECIFICATIONS BY AN AMENDMENT TO BE ISSUED PRIOR TO OPENING OF BIDS.

c. Health and Welfare Funds. - The wage rates contained in this decision are straight hourly wage rates. In some areas management and labor organizations in the construction industry have collectively bargained for health and welfare fund contributions. Such contributions are not included in wage rates determined by the Secretary of Labor for construction projects.

SC-7. VARIATIONS IN ESTIMATED QUANTITIES. - a. Where the quantity of a pay item in this contract is an estimated quantity (identified on Unit Price Schedule with an asterisk) and where the actual quantity of such pay item is more than 115% or less than 87% of the estimated quantity stated in this contract, as modified, an equitable adjustment in the contract price shall be made upon demand of either party. For overruns the equitable adjustment shall be limited to the number of units by which the actual quantity exceeds 115% of the estimated quantities. Where the actual quantity of any pay item is less than 87% of the estimated quantity stated in this contract, the final payment will be computed by applying the contract unit price to 87% of the estimated quantity shown in the contract and then deducting from the result an amount obtained by applying to the number of units of underrun below the 87% of the estimated quantity a negotiated price per unit of such underrun. The unit price for the deduction shall represent the reasonable cost to the contractor of performing the units of work exclusive of the mobilization and other fixed costs relating thereto.

b. In order to permit the contractor to distribute his indirect costs properly to Items Nos. 39, 40 and 99, these items have been sub-divided into sub-items. All the contractor's indirect costs for each of these items will be included in the bid prices for the mobilization and demobilization sub-items listed under the respective items. Variation from the estimated quantity in the actual work performed under any other sub-item or elimination of all work under such a sub-item will not be the basis for an adjustment in contract unit price.

c. If any item within the scope of subparagraph a. above is more than 105% or less than 96% of the estimated quantity stated in the contract, as modified, or if the quantity of any item listed in subparagraph b. above exceeds 105% or is less than 96% of total of the sub-items under that item and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted as follows:

(1) If the quantity variation is such that it will cause an increase in the time necessary for completion, the Contracting Officer shall, upon receipt of a written request for an extension within 10 days from the beginning of such delay or within such further period of time which the Contracting Officer grants prior to the date of final settlement of the contract, ascertain the facts and make such adjustment for extending the completion date as in his judgment the findings justify.

(2) If the quantity variation is such that it will cause a decrease in the time necessary for completion, the Contracting Officer shall ascertain the facts and promptly notify the contractor in writing of his findings and the extent of the adjustment.

d. If the parties fail to agree upon the adjustment to be made the dispute shall be determined as provided in Clause 6, "Disputes" of the General Provisions.

SC-8. GOVERNMENT-FURNISHED PROPERTY. - The Government will furnish to the contractor the following property to be incorporated or installed in the work or used in its performance. Such property will be furnished f.o.b. railroad cars or f.o.b. truck at the project site and the contractor will be required to accept delivery when made, paying any demurrage incurred, and unloading and transporting the property to the job site at his own expense. All such property will be installed and/or incorporated into the work at the expense of the contractor, unless otherwise indicated herein. Any property so furnished which is excess upon the completion of the work shall remain the property of the Government. The contractor shall verify the quantity and condition of such Government furnished property when delivered to him, acknowledge receipt thereof in writing to the Contracting Officer, and in case of damage to or shortage of such property, he shall within 24 hours report in writing such damage and/or shortage to the Contracting Officer.

Quantity	Description
2	Bronze plaques with expansion bolts and rosettes
1	Contaiminated clothes chute
1	Membrane door
1	Antiback-draft valve

SC-9. OMITTED.

SC-10. WATER. - The responsibility shall be upon the contractor to provide and maintain at his own expense an adequate supply of water for his use for construction and domestic consumption, and to install and maintain necessary supply connections and piping for same, but only at such locations and in such manner as may be approved by the Contracting Officer. Before final acceptance, temporary connections and piping installed by the contractor shall be removed in a manner satisfactory to the Contracting Officer.

SC-11. ELECTRICITY. - All electric current required by the contractor shall be furnished at his own expense. All temporary connections for electricity shall be subject to the approval of the Contracting Officer.

All temporary lines will be furnished, installed, connected, and maintained by the contractor in a workmanlike manner satisfactory to the Contracting Officer and shall be removed by the contractor in like manner at his expense prior to final acceptance of the construction.

SC-12. OMITTED.

SC-13. LAYOUT OF WORK AND SURVEYS. - a. Layout of Work. - (1) The Government will establish all baselines, bench marks, and horizontal controls at the site of the work.

(2) From the baselines, bench marks, and controls establish by the Government, the contractor shall complete the layout of the work and shall be responsible for all measurements that may be required for the execution of the work to the location and limit marks prescribed in the specifications or on the contract drawings, subject to such modifications as the Contracting Officer may require to meet changed conditions or as a result of necessary modifications to the contract work.

(3) The contractor shall furnish, at his own expense, such stakes, templates, platforms, equipment, tools and material, and all labor as may be required in laying out any part of the work from the baselines and bench marks established by the Government. It shall be the responsibility of the contractor to maintain and preserve all stakes and other marks established by the Contracting Officer until authorized to remove them, and if such marks are destroyed, by the contractor or through his negligence prior to their authorized removal they may be replaced by the Contracting Officer, at his descretion, and the expense of replacement will be deducted from any amounts due or to become due the contractor. The Contracting Officer may require that work be suspended at any time when location and limit marks established by the contractor are not reasonably adequate to permit checking of the work.

b. Quantity Surveys. - (1) The contractor shall furnish all personnel, equipment and material required to make all original and final surveys to determine the quantities forming the basis of final payments. Such surveys will be made under the direct supervision of a Government employee who will also record the notes and supervise the computations by contractor personnel. Original copies of survey notes will become the property of the Government.

(2) The contractor shall make such surveys and computations as are necessary to determine the quantities of work performed or placed during each period for which a progress payment is to be made. All original field notes, computations, and other records taken by the contractor for the purpose of progress surveys shall be furnished promptly to the representative of the Contracting Officer and shall be used to the extent necessary in determining the proper amount of progress payments due to the contractor. Unless waived in each specific case, quantity surveys made by the contractor shall be made under the direction of a representative of the Contracting Officer.

c. Verification. - The Government may make checks as the work progresses to verify lines and grades established by the contractor and to determine the conformance of the completed work as it progresses with the requirements of contract specifications and drawings. Such checking by the Contracting Officer or his representatives shall not relieve the contractor of his responsibility to perform all work in accordance with the contract drawings and specifications and the lines and grades given therein.

SC-14. PAYMENTS FOR MOBILIZATION AND PREPARATORY WORK. - Payments will not be made under this contract for mobilization and preparatory work.

SC-15. DAMAGE TO WORK. - a. The responsibility for damage to any part of the work to be performed under this contract shall be as set forth in the article of the contract entitled "Permits and Responsibility for Work". However, if the permanent cofferdam is constructed in accordance with plans and progress schedules approved by the Contracting Officer, but is overtopped by flood or earthquake and such flood or earthquake causes damages to the permanent cofferdam and/or any part of the permanent work, which damage is not due to the failure of the contractor to take reasonable precaution or to exercise sound engineering and construction practices in the conduct of the work, the contractor will make the repairs ordered by the Contracting Officer and full compensation for such repairs will be made at the applicable contract unit or lump sum prices as fixed and established in the contract. If in the opinion of the Contracting Officer, there are no contract unit or lump sum prices applicable to any part of such damaged work, an equitable adjustment pursuant to Article 3, Changes, of the contract, will be made as full compensation therefor.

b. The contractor may, subject to approval of the Contracting Officer, or the Contracting Officer may order the contractor to, flood or breach the permanent cofferdam during a rise prior to, and in anticipation of, natural flooding due to overtopping. Such flooding or breach will be considered the same as though the permanent cofferdam, if constructed in accordance with plans and progress schedules approved by the Contracting Officer, has been overtopped, in which event an equitable adjustment will be made for damages to the permanent cofferdam and/or any part of the permanent work, as provided in a. above.

c. Maintenance of Drainage. - The contractor will be required to maintain adequate drainage through drainage structures and waterways during the life of the contract. When winter weather conditions are such as to cause obstruction of normal drainage ways by accumulations of ice, snow, or a combination of both, suitable measures, such as application of salt, shall be instituted by the contractor and maintained to prevent damage to materials or new or existing work.

SC-16 to SC-23, Inclusive. OMITTED.

SC-24. FUNDS AVAILABLE FOR PAYMENTS. - a. Such work as may be done under this contract in excess of the amount for which funds are available for payment as herein set forth, will be continued with funds hereafter appropriated and alloted for this work.

b. From funds heretofore appropriated by the Flood Control Act, approved 3 July 1958, Public law 85-500, the sum of $25,000.00 is avilable for payments to the contractor for work performed under this contract.

c. If at any time it becomes apparent to the Contracting Officer that the balance of this allocation is in excess of the amount required to meet all payments due and to become due the contractor because of work performed and to be performed pursuant to his approved progress schedule, the right is reserved after due notice to the contractor to reduce said allocation by the amount of such excess.

d. If the rate of progress of the work is such that it becomes apparent to the Contracting Officer that the balance of this allocation and any allocation for this and any subsequent fiscal years during the period of this contract is less than that required to meet all payments due and to become due the contractor because of work performed or to be performed under this contract, the Contracting Officer may provide additional funds for such payments if there be funds available for such purpose. The contractor will be notified in writing of any additional funds so made available. However, it is distinctly understood and agreed that the amount of funds stated in b. above is the maximum amount the Government insures will be available during the current fiscal year and the Government is in no case liable for payments to the contractor beyond this amount prior to having notified the contractor in writing of any additional funds that can be made available. Accordingly, no progress schedule will be approved (see Par. GC-5(a)) which contemplates progress requiring funds in excess of the amount stated to be available in b. above for the current fiscal year and no progress schedule will be approved for any ensuing fiscal year which contemplates progress requiring funds in excess of the amount allocated by the Contracting Officer from funds subsequently made available, except as set forth and subject to the conditions in subparagraph i. below.

e. It is expected that, during subsequent fiscal years over the period of this contract, Congress will make additional appropriations for expenditure on work under this contract. The Contracting Officer will notify the contractor of any additional allocation of funds to this contract when such funds become available. It is understood and agreed that the Government is in no case liable for damages in connection with this contract on account of delay in payments to the contractor due to lack of available funds. Should it become apparent to the Contracting Officer that the available funds will be exhausted before additional funds can be made available, the Contracting Officer will give at least 30 days written notice to the contractor that the work may be suspended. If the contractor so elects, after receipt

of such notice, he may continue work under the conditions and restrictions under the specifications, so long as there are funds for inspection and superintendence, with the understanding, however, that no payment will be made for such work unless additional funds shall become available in sufficient amount. When funds again become available, the contractor will be notified accordingly. Should work be thus suspended, additional time for completion will be allowed equal to the period during which work is necessarily so suspended, as determined by the dates specified in the above-mentioned notices.

f. So long as funds are available, payments will be made monthly in accordance with article of the contract entitled, "Payments to Contractors." The unit prices or lump sum price or prices stated in the contract will be used in determining the amount to be paid for work performed by the contractor.

g. The procedure above described will be repeated as often as may be necessary on account of the exhaustion of available funds and the necessity of awaiting the appropriation of additional funds by Congress.

h. Should Congress fail to provide additional funds the contract may be terminated and considered to be completed, at the option of the contractor, without prejudice to him or liability to the Government, at any time subsequent to 30 days after payments are discontinued, or at any time subsequent to 30 days after passage of the Act which would have but did not carry an appropriation for continuing the work or after the adjournment of the Congress which failed to make the necessary appropriations. However, if the funds cited in the contract are enough to extend the work beyond the end of the fiscal year and no new funds are allocated to the contract for the ensuing fiscal year, the contractor must first exhaust all the cited funds and thereafter he may, at his option, exercise the rights provided in this paragraph any time after payments are discontinued.

i. The progress chart prepared in accordance with GC-5(a) will be consistent with the amount of funds stated in subparagraph b. above, as being currently available for the period of time from the date of contract award to the end of the fiscal year in which the contract was awarded, or at the option of the contractor, the chart may be prepared on the basis of accomplishment of work at a greater rate of progress for the period of time applicable to currently available funds. Any chart initially submitted for approval which contemplates progress at a greater rate than can be paid for with currently available funds will be approved only under the condition that such approval will in no way obligate the Government to make additional funds available for the work. That part of the chart which covers the work for which funds are not currently available will be prepared on the basis of a schedule considered to be practicable by the contractor for accomplishment of the work at such rate of progress as he may desire for completion within the terms of the contract. The progress chart will be revised each time the contractor is notified that

additional funds are made available. Each revision will conform with the criteria stated above. With reference to the responsibilities for future funding of the work in accordance with the progress chart, attention is called to the preceding subparagraphs wherein the responsibilities of the Government are set forth for the furnishing of funds for the work. The approval of that part of the schedule covering work for which funds are not currently available will in no way obligate the Government to provide funds to accomplish work at the rate of progress indicated in the schedule.

SC-25. OMITTED

SC-26. OMITTED

SC-27. ADDITIONAL SUPERVISION OF SUBCONTRACTED WORK. - The contractor shall be required to furnish the following in addition to the superintendence required by the General Provisions entitled "Superintendence by Contractor":

a. If less than 70 percent and more than 50 percent of the value of the contract work is subcontracted one superintendent shall be provided at the site and on the contractor's payroll to be responsible for coordinating, directing, and expediting the subcontracted work.

b. If 70 percent or more of the value of the work is subcontracted the contractor shall be required to furnish two superintendents to be responsible for coordinating, directing and expediting the subcontract work. If the Contracting Officer at any time after 50 percent of the subcontracted work has been completed finds that satisfactory progress is being made, he may waive all or part of the above requirement for additional superintendence subject to the right of the Contracting Officer to reinstate such requirement if at any time during the progress of the work he finds that satisfactory progress is not being made.

SC-28. SCHEDULING AND DETERMINATION OF PROGRESS. - a. Independent of partial payments made pursuant to General Provision 7, Payments, (Standard Form 23A), progress schedules prepared under the requirements of GC-5, Progress Charts and Requirements for Overtime Work, shall provide as scheduled progress for only 25 percent of the estimated invoiced cost of materials or equipment delivered to the site but not incorporated in the work as of the time of the scheduled delivery thereof.

b. In determining progress accomplished the Contracting Officer will allow as an element of work accomplished (progress toward completion) only 25 percent of the invoiced cost of materials or equipment delivered to the site but not incorporated in the construction up to the time the materials or equipment are actually incorporated in the work.

SC-29. TIME EXTENSIONS. - Notwithstanding any other provisions of this contract it is mutually understood that the Government has the right to determine the extent, if any, by which a change in plans or specifications or excusable delays will cause delay in the completion of various elements of construction. The Contracting Officer may unilaterally provide in a change order that a contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion date for all other portions of the work would not be altered and further provide for an equitable readjustment of liquidated damages, if any, pursuant to the new completion schedule.

SC-30. REVERSE SIGNAL ALARMS. - All self-propelled construction equipment, except light service trucks, panels, pickups, station wagons, crawler-type cranes, power shovels and draglines; whether moving alone or in combination shall be equipped with a reverse signal alarm. The alarm shall be mounted on the rear of the equipment and shall be so protected or constructed as to withstand severe wear and tear, adverse weather and unfavorable environmental working conditions and shall be certified by the manufacturer as fully meeting the following performance standards.

The alarm shall produce a relatively pure tone which shall peak within the American Standards Association standard octave passband of 600 to 2400 cycles per second and shall produce a 0.2 to 0.5 second audible warning within the initial three (3) feet of backward movement of the vehicle on which it is mounted and at regular intervals, not to exceed three (3) seconds throughout the backward movement. The alarm shall automatically cut out when backward movement ceases. The sound intensity of the alarm shall range from and not exceed 90-100 db (decibals) at a horizontal distance of 5 feet from the alarm.

Actuation of the alarm shall be automatic by direct connection to any part of the equipment that moves or acts in a manner distinctive only to the rearward movement of the vehicle with no manual controls of any kind between the source of actuation and the alarm. Where application of this requirement to specific types of equipment has impractical application other means of actuation may be used upon written approval of the Contracting Officer.

The use of the alarm shall be in addition to prescribed requirements for signalmen.

SC-31. OMITTED

SC-32. SAFETY NETS. - Safety nets shall be provided and installed for the protection of persons and property on the following operations:

a. Construction of access and service bridges.

The nets shall be in good condition, with not less than 3/8-inch diameter manila mesh ropes arranged at not more than 6 inch centers, positively attached to avoid wear at each point of crossing and at points of contact with 3/4-inch diameter border ropes. Net attachment and suspension system shall be in accordance with the net manufacturer's recommendations. No operation which requires safety net protection shall be undertaken until the safety net is properly installed.

The safety nets shall be faced with a 1-inch mesh wire meshing when men are required to work below nets, when nets are over streets or other traffic ways, or when required to protect installed equipment or finished work.

SC-33. PERFORMANCE OF WORK BY CONTRACTOR. - The contractor shall perform on the site and with his own organization, work equivalent to at least twenty percent (20%) of the total amount of the work to be performed under the contract. If during the progress of the work hereunder, the contractor requests a reduction in such percentage, and the Contracting Officer determines that it would be to the Government's advantage, the percentage of the work required to be performed by the contractor may be reduced; provided, written approval of such reduction is obtained by the contractor from the Contracting Officer.

SC-34. CONTRACT BID BREAKDOWN. - The contractor shall furnish within 10 days after date of award of contract a breakdown of each lump sum bid. Partial payments will be based on this breakdown. The contractor's breakdown will be reviewed by the Contracting Officer to insure that costs are proportioned properly between early and late pay items. Any unbalanced items or other discrepancies will be revised by the Contracting Officer and the approved breakdown will be utilized as a basis for progress payments to the contractor.

SC-35. TEMPORARY HEAT. - All temporary heat required by the contractor in connection with his construction operations shall be furnished or provided by or at the expense of the contractor. No source of any Government type of heating system will be available for the use of the contractor. Heaters shall be listed by the Underwriters' Laboratories, Inc., and be installed and maintained in accordance with the manufacturers' instructions. The use of "salamanders" shall not be permitted. If the contractor is permitted to use the heating system of any structure for temporary heat, all fuel oil remaining in the tank upon completion of the work shall become the property of the Government at no additional cost.

SC-36. OMITTED

SC-37. SOILS AND MATERIALS CONTROL. - a. The contractor shall furnish two vehicles, preferably pick-up trucks, the maintenance and operation of which will be the contractor's responsibility, and shall

provide four employees, approved and qualified as stated below, to aid the Contracting Officer in the sampling and testing of soils, portland cement concrete, bituminous concrete, and similar materials. Employee qualifications shall include a high school education or the equivalent thereof. The work to be done by these employees shall include, but shall not be limited to, assisting in the performance of field and laboratory tests. Each employee shall be adaptable to the anticipated work and his final acceptance by the Contracting Officer will not be made until he has undergone a two-week training period at the New England Division Laboratories in Waltham, Mass. The personnel and equipment shall be made available within 30 days after receipt of notice to proceed and shall be assigned full-time and continuously to the Contracting Officer until no further sampling and testing is required. The personnel and equipment shall be under the direction and supervision of the Contracting Officer and shall be such as to permit sampling and testing to be maintained and concurrent with the progress of construction to insure that sampling and testing will be performed continuously. Sampling and testing will include that necessary to determine that all construction conforms to contract requirements and such other sampling for the project as directed. No separate payment will be made for the services of the above equipment and personnel, the costs of which will be considered as a subsidiary obligation of the contractor.

SC-38. CONSTRUCTION SIGN. - The contractor shall furnish and erect a construction sign conforming to the requirements of Drawing No. CT-1-5818, Sheet 1, 12 ft. x 6 ft., attached at the end of the SPECIAL CONDITIONS. The sign shall be erected at a location selected by the Contracting Officer not later than 30 calendar days after notice to proceed. Upon completion of the work, the sign will remain the property of the contractor. No separate payment will be made for furnishing and erecting the sign.

SC-39. SAFETY SIGN. - The contractor shall construct a safety sign at a location directed by the Contracting Officer. The sign shall be 3 feet by 6 feet in size and shall conform to the requirements of Drawing No. 40-05-06, Sheet 1 of 1 attached hereto. The sign shall be erected as soon as possible and within 30 calendar days after date of notice to proceed. The date required by the sign shall be corrected as necessary. No separate payment will be made for erecting and maintaining the safety sign and all costs in connection therewith will be considered a subsidiary obligation of the contractor. The sign will remain the property of the contractor. A previously built sign may be reused when satisfactorily reconditioned.

SC-40. ACCIDENT PREVENTION. - a. Contractor's Proposals. - The contractor's proposals for effectuating the requirements of Paragraph GC-16, "Accident Prevention" shall be submitted in quintuplicate to the Resident Engineer as the Contracting Officer's representative.

b. Transportation of Explosives. - Transportation of explosives and other dangerous articles by the contractor shall be in accordance with Subparagraph e. below, appropriate regulations, local laws or ordinances, and the Corps of Engineers Manual "General Safety Requirements".

c. Outlining Loaded Hole Areas. - The contractor shall be required to clearly outline any loaded hole area, or areas. This may be accomplished by roping off the entire loaded hole area, or by markers of sufficient height, color, and spaced so that the entire loaded hole area will be clearly and definitely outlined. The exact method of outlining such areas shall have the prior approval of the Contracting Officer.

d. Protective Headgear. - All employees of the contractor and other persons shall wear protective headgear (hard hats) at all times while in the work area(s). These work area(s) shall be all area(s) within the contract work limits.

e. General Requirements. - All applicable requirements of the safe practices on construction work as covered in the "Manual of Accident Prevention in Construction" as published by the Associated General Contractors of America, Inc., shall apply to the work under this contract. Particular attention is invited to the manual's requirements covering tunnels and shafts. The requirements listed in the manual are minimum requirements and do not decrease or eliminate any other accident prevention features covered in other parts of these specifications.

f. Use of Swing Scaffolds. - In addition to the requirements of the Corps of Engineers Manual "General Safety Requirements", the following shall be required when swing scaffolds are used:

(1) A safety line, hung independent of the scaffold and its support, and which reaches the ground, shall be provided for each workman on a swinging scaffold.

(2) Each workman shall wear a safety belt attached to the safety line by an approved method so as to prevent a free fall of more than five feet.

SC-41. SPARE PARTS DATA. - The contractor shall provide spare parts data for all items of equipment having moving parts or otherwise subject to wear, furnished and installed by him. The data shall be in the form of an equipment manufacturer's spare parts catalog and an operation and maintenance manual. Accompanying the spare parts catalog shall be a list indicating the quantity of each spare part which the equipment manufacturer recommends as required to insure efficient operating capability for a period of 120 days. The list shall also indicate the unit price of each spare part and the source of procurement. The required data shall be submitted as a complete package for each item of work for which a completion date is established and as soon after award of contract as practicable,

but in any case not later than one hundred twenty (120) days prior to completion of the applicable item of work and shall be completely marked as to contents, job and contract number.

SC-42. GUARANTEE. - Where the Technical Provisions require that certain equipment is to be guaranteed, the guarantee shall be for a period of one year from the date of acceptance thereof, either for beneficial use or final acceptance, whichever is earlier, against defective materials, design and workmanship. Upon receipt of notice from the Government of failure of any part of the guaranteed equipment during the guaranteed period, the affected part or parts shall be replaced promptly with new parts by and at the expense of the contractor. Installation of new parts shall also be by and at the expense of the contractor.

SC-43. OPERATOR'S QUARTERS. - Funds for the construction of the Operator's Quarters, including the Garage, are limited due to Congressional limitations. In the event the work for these structures are deleted from the work (See Note 3 in Unit Price Schedule), the contractor shall cap all underground pipes 5-feet outside building walls, grade the areas to blend into indicated adjacent grade, including topsoiling and seeding. All work outside the building lines included under Items 97 and 98, such as concrete walks, shall also be deleted. The contractor however, shall perform all other work in area (except Item 101). Payment for additional topsoiling and seeding will be made at the applicable contract price.

SC-44. IDENTIFICATION OF MECHANIZED EQUIPMENT. - All contractor's machinery, motor vehicles and mechanized equipment as may be required by the Contracting Officer, shall have posted in a conspicuous location on each piece of equipment, acceptable identification showing the owner's name and an identifying number.

SC-45. OMITTED

SC-46. PROJECT BULLETIN BOARD. - The contractor shall furnish, install and maintain during the life of the project a weathertight bulletin board approximately 3 feet high by 5 feet wide having not less than 2 hinged or sliding glazed doors with provisions for locking. The bulletin board shall be mounted, where and as approved by the Contracting Officer, in a prominent place accessible to all employees. The bulletin board shall remain the property of the contractor and shall be removed by him upon completion of the contract work. The following information, which will be furnished by the Government to the contractor, shall be posted on the bulletin board and shall be maintained by the contractor in easily readable condition at all times for the duration of the contract.

a. The Equal Economic Opportunity poster as required by General Provisions (Standard Form 23A) Clause 19, Non-discrimination in Employment.

b. The schedule of minimum wage rates for the contract as required by General Provisions (Standard Form 23A) Clause 20, Davis-Bacon Act with the minimum wage rate poster form (SOL-155).

SC-47. CERTIFICATES. - Whenever specifically required by the specifications that a certified statement be furnished to indicate compliance with a contract requirement, and in those instances where a certificate is deemed necessary by the Contracting Officer as evidence of compliance with specific contract requirements, the following will be applicable in preparing the certificates:

a. The name of the contractor, contract number, project identification and location shall be indicated.

b. Specific reference shall be made to the section of the specifications under which certification of material is furnished.

c. There must be set forth a general description of the material furnished including a statement as to how and where the material is to be used under this contract.

d. Certificates made by testing laboratories concerning composition of materials shall, in addition to the above information, indicate that the certification applies specifically to batches or lots of material shipped. These batches or lots, etc., must be designated by number or other means of identification specifying quantity and date of shipment, etc.

e. Certificates must be signed by an authorized representative of the manufacturer and must indicate the title of the signator. If signed by other than an officer of the firm, evidence of authorization by the firm must be furnished the Contracting Officer.

f. Certificates shall be furnished in triplicate.

g. All certificates must be notarized.

SC-48. OMITTED

SC-49. OMITTED

SC-50. DEVIATIONS FROM CONTRACT REQUIREMENTS. - Deviations from contract requirements will not be permitted, except under unusual circumstances. Submissions of shop drawings and materials will be assumed to be in conformance with plans and specifications, unless they contain an expressed declaration of a deviation, the reasons for it, and request for waiver.

SC-51. CONTRACTOR'S OPTIONS. - The Technical Provisions by specific references permit the contractor to select optional materials, items, systems, or equipment. The use of options is subject to the following conditions:

a. Once an option has been selected and approved, it shall be used for the entire contract.

b. The contractor will be required to coordinate his selections with the plans and specifications and to make all necessary adjustments without additional cost to the Government.

SC-52. CONCRETE AGGREGATE - APPROVED SOURCES. - Concrete aggregate meeting the requirements of these specifications can be produced from the approved sources listed below:

Type	Source
Fine and Coarse (River Deposit Only)	Donovan Bros., Inc. Huntington, Mass.
Fine and Coarse	Bill Willard, Inc. Northhampton, Mass.
Coarse	John S. Lane & Sons, Inc. Westfield, Mass.

Concrete aggregates may be furnished from any of the above listed sources, or at the option of the contractor may be furnished from any other source or sources proposed by the contractor and approved by the Contracting Officer. The contractor shall designate in writing the source or sources from which he will furnish the aggregate. If the fine aggregate and coarse aggregate are not to be furnished from the same source, the contractor shall supply coarse aggregate from one source only and fine aggregate from one source only. If the contractor proposes to furnish aggregate from a source or from sources not already approved, he may designate only one source for both coarse and fine aggregate or one source for each. Samples for testing shall be provided as required by Section 14 of the Technical Provisions. If a source proposed by the contractor is not approved for use as determined by the Contracting Officer, the contractor shall furnish aggregate from an approved source listed above at no additional cost to the Government. Approval of a source of concrete aggregate is not to be construed as approval of all material from that source. The right is reserved to reject materials from certain localized areas, zones, strata, or channels when such materials are unsuitable for concrete aggregate as determined by the Contracting Officer. Materials produced from an approved source shall meet all of the grading, uniformity, and particle shape requirements of Section 14 of the Technical Provisions of these specifications.

SC-53. FACTORS AFFECTING THE PROSECUTION OF THE WORK. - a. Goss Hill Road. - (1) The contractor will be required to permit travel by others over Goss Hill Road during the relocation and improvement operations. All required barricades, lights, signs, etc. as required for safe passage shall be provided.

(2) The contractor shall not interfere with traffic over the existing road where relocation is required until the new section of road is completed. No borrow operations will be permitted in this area that would interfere with road travel.

b. Responsibility. - Section 2 covers the construction of auxiliary and temporary cofferdams relative to the construction of certain phases of the work. The contractor's attention is directed to the fact that any damage to the new work due to flooding or by failure of the contractor to properly construct the temporary and auxiliary cofferdams shall be repaired by and at the expense of the contractor as outlined in Section 2.

SC-54. WARNING SIGNS. - The contractor shall construct, erect, and maintain four warning signs at various locations, where directed, along the perimeter of the contractor's work areas. These signs will generally be located where existing roads enter the work areas. The signs shall be 4 feet by 2 feet in size and shall be securely mounted on wood posts provided and installed by the contractor. The signs may be made of 1/2-inch plywood, 3/4-inch dressed stock, not less than 8 inches in width held together with 3/4-inch by 2-inch battens on the rear, or from galvanized sheet metal (16 gage) properly reinforced. After assembly, all surfaces of the sign shall be given not less than two coats of a white exterior type finish paint. If wood is used, the wood shall be primed prior to finish painting. Lettering shall be of proper size for the intended use and shall be done by a sign painter, using quick-drying paint. The following words shall appear on the sign:

DANGER
BLASTING OPERATIONS
TURN OFF ALL 2-WAY RADIOS

Wood signs shall be fastened to wood posts with not less than three 2-inch galvanized wood screws. Metal signs shall be installed in similar manner. The warning signs shall be erected as soon as possible and within 30 calendar days after date of receipt of notice to proceed. No separate payment will be made for erecting all signs and maintaining and removal of the warning signs when the entire work is completed, and all costs in connection therewith will be considered a subsidiary obligation of the contractor.

SC-55. PLANT. - The contractor agrees to keep on the job sufficient plant to meet the requirements of the work. The plant shall be in satisfactory operating condition and capable of safely and efficiently performing

the work as set forth in the specifications and the plant shall be subject to inspection by the Contracting Officer at all times. The following plant is the minimum which the contractor agrees to place on the job unless otherwise determined by the Contracting Officer; its listing herein is not to be construed as an agreement on the part of the Government that it is adequate for the performance of the work.

Minimum Plant to be Used on the Work
(To be Filled in before Contract is Signed)

No.	Type	Capacity	Condition

The measure of the "capacity of the Plant" shall be its actual performance on the work to which these specifications apply.

SC-56. BLASTING. - a. All operations involving the transportation, storage and use of explosives shall be conducted in accordance with applicable laws and the Corps of Engineers' "General Safety Requirements Manual" a copy of which is available for inspection in the office of the Division Engineer and the "Manual of Accident Prevention in Construction".

b. All vehicles assigned to the daily transportation of explosives and other dangerous articles will be inspected not less frequently than once a week. Vehicles which are occasionally used for this purpose shall be inspected within one week prior to such use.

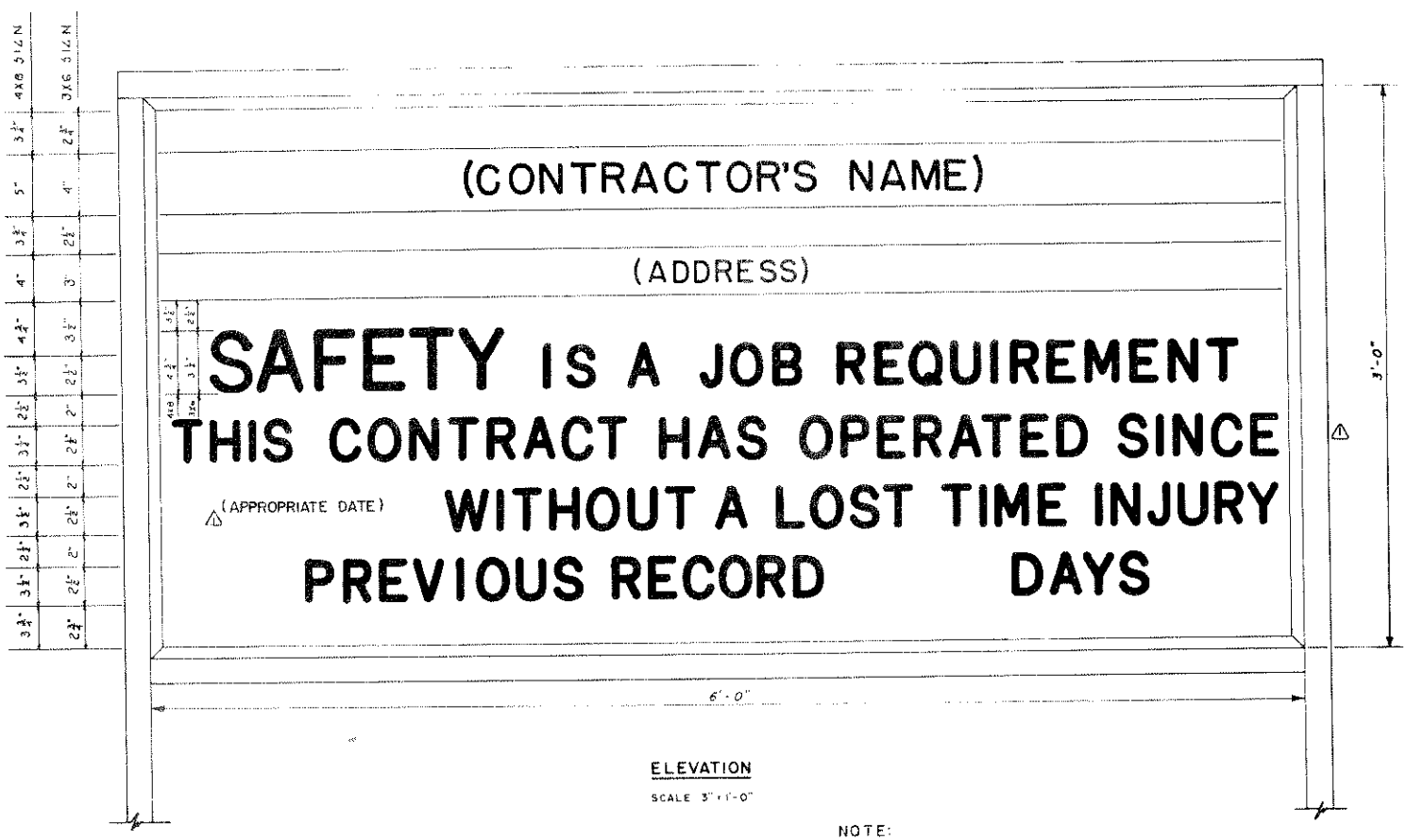
c. Inspection shall be performed by competent assigned contractor's personnel other than the operator of the vehicle inspected. Inspection forms will be approved by the Contracting Officer and a completed copy of each inspection will be furnished the Contracting Officer.

d. Blasting will be permitted only when proper precautions are taken for the protection of all persons, work, and property, and any damage done to the work or property shall be repaired promptly by the contractor

at his expense. The contractor or his surety shall, prior to commencement of blasting operations, make all necessary investigations including inspection of structures near the area of blasting and will, during blasting, control vibration as necessary to assure protection of these structures in conformance with regulatory statutes or directives established by State or other authorities to limit the amount of vibration generated by blasting.

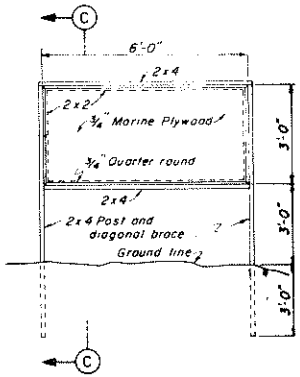
CORPS OF ENGINEERS

U. S. ARMY

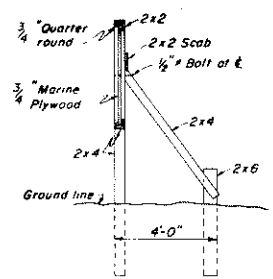


ELEVATION

SCALE 3" = 1'-0"



ELEVATION



SECTION C-C

3' x 6' SIGN

(4' x 8' SIGN SIMILAR)

NOTE:

This elevation is of a 3' x 6' Sign. See specifications for size required under this contract.

⚠ **SPECIFICATIONS**

1. Posts, rails and bracing shall be No.1 yellow pine or approved equal S4S-Fed. Spec. MM-L-751c.

2. All exposed surfaces, including edges, shall be given one coat of linseed oil and wiped prior to primer coat, one coat of exterior lead and oil primer conforming to Fed. Spec. TT-P-25a, and two finish coats of white exterior paint conforming to Fed. Spec. TT-P-104.

3. Black lettering paint shall be Kem Bulletin Color C20 BI as manufactured by Sherwin-Williams Co., or approved equal.

4. Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.

REVISION	DATE	DESCRIPTION	BY
⚠	4-11-57	Sign information and specifications revised.	

CORPS OF ENGINEERS U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NEW ENGLAND DIVISION
BOSTON 4455

DES BY CM | DR BY N.S. | CK BY

CHIEF DESIGN BRANCH

PROJECT ENGINEER

SUBMITTED BY

CHIEF MILITARY BRANCH

APPROVED

CHIEF ENGINEERING DIV

APPROVED

COL. CE FOR THE DIVISION ENGINEER

SAFETY SIGN

DATE JULY 1955

SCALE AS SHOWN | SPEC NO

DRAWING NUMBER
40-05-06

SHEET 1 OF 1

⚠

UNIFIED SOIL CLASSIFICATION
(Including Identification and Description)

Major Divisions			Group Symbols	Typical Names	Field Identification Procedures (Excluding particles larger than 3 in. and basing fractions on estimated weight)	Laboratory Classification Criteria
Coarse-grained Soils: More than half of material is larger than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.	Gravels: More than half of coarse fraction is larger than No. 4 sieve size. (For visual classification, the 1/4-in. size may be used as equivalent to the No. 4 sieve size.)	Clean Gravels (Little or no fines)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.	Determine percentages of gravel and sand from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size) coarse-grained soils are classified as follows: Less than 5% — GW, GP, SW, SP. More than 12% — GM, GC, SM, SC. 5% to 12% — Borderline cases requiring use of dual symbols.
			GP	Poorly graded gravels, or gravel-sand mixtures, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.	
		Gravels with Fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixture.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	
			GC	Clayey gravels, gravel-sand-clay mixture.	Plastic fines (for identification procedures see CL below).	
	Sands: More than half of coarse fraction is smaller than No. 4 sieve size.	Clean Sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines.	Wide range in grain size and substantial amounts of all intermediate particle sizes.	
			SP	Poorly graded sands or gravelly sands, little or no fines.	Predominantly one size or a range of sizes with some intermediate sizes missing.	
		Sands with Fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures.	Nonplastic fines or fines with low plasticity (for identification procedures see ML below).	
			SC	Clayey sands, sand-clay mixtures.	Plastic fines (for identification procedures see CL below).	

$C_u = \frac{D_{60}}{D_{10}}$ Greater than 4

$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3

Not meeting all gradation requirements for GW

Atterberg limits below "A" line with PI less than 4	Above "A" line with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Atterberg limits above "A" line with PI greater than 7	

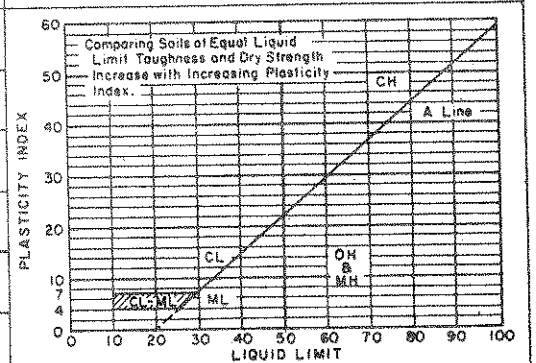
$C_u = \frac{D_{60}}{D_{10}}$ Greater than 6

$C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3

Not meeting all gradation requirements for SW

Atterberg limits above "A" line or PI less than 4	Limits plotting in hatched zone with PI between 4 and 7 are borderline cases requiring use of dual symbols.
Atterberg limits above "A" line with PI greater than 7	

Fine-grained Soils: More than half of material is smaller than No. 200 sieve size. The No. 200 sieve size is about the smallest particle visible to the naked eye.					Identification Procedures on Fraction Smaller than No. 40 Sieve Size		
					Dry Strength (Crushing characteristics)	Dilatancy (Reaction to shaking)	Toughness (Consistency near PL)
	Silts and Clays: Liquid limit is less than 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.	None to slight	Quick to slow	None
			CL	Inorganic clays of low to medium plasticity gravelly clays, sandy clays, silty clays, lean clays.	Medium to high	None to very slow	Medium
			OL	Organic silts and organic silty clays of low plasticity.	Slight to medium	Slow	Slight
	Silts and Clays: Liquid limit is greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	Slight to medium	Slow to none	Slight to medium
			CH	Inorganic clays of high plasticity, fat clays.	High to very high	None	High
			OH	Organic clays of medium to high plasticity, organic silts.	Medium to high	None to very slow	Slight to Medium
Highly Organic Soils			PT	Peat and other highly organic soils.	Readily identified by color, odor, spongy feel and frequently by fibrous texture.		



PLASTICITY CHART
For laboratory classification of fine-grained soils

(1) Boundry classifications: Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well-graded gravel-sand mixture with clay binder.
(2) All sieve sizes on this chart are U. S. standard.

NOTE

For further information on Unified Soil Classification, refer to "The Unified Soil Classification System," Volumes 1 and 2, Technical Memorandum No. 3-357, published by U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. File copies may be examined at Headquarters, U. S. Army Engineer Division, New England, 424 Trapelo Road, Waltham, Massachusetts., Building 141, Foundation and Materials Branch.

Adopted by Corps of Engineers and Bureau of Reclamation, January 1952

NEDGL 61-150

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.
FD-1	553.2	J-3	5.0- 8.9	SM	39	45	16														
		J-5	10.0-10.8	SM	1	58	41	0.015													
		J-7	15.0-20.0	SM	20	55	25	0.024													
		J-9	25.0-26.0	ML	1	40	59	0.017													
		J-12	30.0-32.7	SP-SM	3	86	11	0.072													
		J-13	32.7-35.0	SM	13	50	37	0.02													
		J-15	37.0-38.7	SM	3	49	48	0.011													
FD-2	503.5	J-2	2.2- 5.0	SM	20	48	32	0.018													
		J-4	10.0-11.6	SM	34	37	29	0.014													
FD-3	534.0	J-1	0.5- 5.0	SM	18	43	39	0.015													
		J-3	8.0- 9.5	SM	11	48	41	0.014													
FD-4	536.0	J-2	3.0- 5.0	SM	22	40	38	0.031													
		J-4	7.0- 8.6	SM	2	56	42	0.026													
FD-5	439.6	J-2	1.0- 5.0	SP-SM	0	88	12	0.07													
		J-7	30.0-33.1	SM	22	42	36	0.007													
		J-9	40.0-42.2	SM	21	42	37	0.0085													
FD-6	501.3	J-3	5.0-10.0	SM	32	52	16	0.043													
		J-5	15.0-19.0	GM	46	40	14	-													
		J-8	25.0-30.0	ML	6	38	56	0.015													
		J-11	35.0-40.0	ML	4	43	53	0.0038													
		J-14	50.0-54.7	ML	7	41	52	0.0026													
		J-17	70.0-72.8	SM	5	48	47	0.0052													
		J-19	85.0-89.8	SM	9	59	32	0.0098													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-7	517.0	J-5	13.0-15.0	SM	29	32	39	0.011														
		J-6	15.0-20.0	ML	5	28	67	0.0049														
		J-9	30.0-34.2	SM	21	43	36	0.007														
FD-8	533.3	J-2	2.2- 3.3	SM	9	55	36	0.018														
		J-9	13.9-18.9	SM	14	66	20	0.05				11.8	13.8									
		J-12	21.8-23.9	SM	30	42	28	0.024				9.6	13.8									
		J-15	25.0-27.4	SM	15	56	29	0.021				6.6	7.7									
		J-18	30.2-33.0	SM	3	65	32	0.024				14.1	14.6									
		J-24	43.1-43.5	SM	1	59	40	0.019				12.7	—									
FD-9	557.0	J-3	5.0-10.0	SM	15	48	37	0.02				6.2	7.3									
		J-5	10.0-12.7	GM								10.2	18.2									
		J-5	10.0-12.7	GM	44	38	18	0.053														
		J-8	17.9-20.2	SM	8	62	30	0.03				15.4	16.7									
FD-10	575.0	B-5	3.6- 5.0	SM	12	49	39	0.01														
		B-8	5.0-10.0	SM	22	44	34	0.013														
		J-10	13.5-14.5	SM								14.6	16.2									
		B-11	10.0-15.0	SM	17	58	25	0.024														
		J-12	15.0-15.7	SM	35	42	23	0.034				21.3	22.9									
		J-7	7.0- 7.7	SM								12.1	15.0									
FD-12	440.4	B-6	7.0-10.0	GP	80	18	2	0.51														
		B-8	10.0-15.0	GP	59	37	4	0.14														
		J-11R	15.0-20.0	GP							2.86	18.1	21.7									
		B-12	20.0-25.0	GP	71	26	3	0.4														
		B-16	30.0-35.0	SM	38	50	12	<0.074														
		J-17R	30.0-35.0	SM								13.6	22.2									
		B-18	35.0-40.0	GP-GM	54	38	8	0.1														
		J-20R	40.0-45.0	ML	5	16	79	0.0025	26	29												

PAGE NO. A-2

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	STND. AASHO OPT. WATER % DRY WT	STND. AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-13	442.8	B-9	7.0-10.0	SP-SM	34	57	9	0.091				17.5	21.5									
		J-10R	7.0-10.0	SP-SM																		
		B-11	10.0-15.0	SM	3	81	16															
		J-12R	10.0-15.0	SM							2.74		26.7									
		B-13	15.0-20.0	SM	0	61	39	0.025														
		B-17	25.0-30.0	GM	47	41	12															
		B-22	34.0-39.0	GP-GM	47	43	10	0.074														
		J-25R	39.0-41.0	SM								9.2	12.6									
		B-27	42.0-46.0	GP-GM	55	36	9	0.091														
		J-28R	42.0-46.0	GP-GM								6.7	16.9									
FD-14	546.9	B-6	5.0-10.0	SM	22	53	25															
FD-15	453.3	B-4	1.2- 5.0	SM	41	46	13															
FD-16	440.6	B-3	5.0- 8.0	GP-GM	69	26	5	0.17														
		B-8	10.0-15.0	SM	32	55	13															
		B-16	30.0-35.0	GM	46	36	18															
		B-22	45.0-50.0	GP-GM	59	34	7	0.13														
FD-17	470.0	B-8	12.0-16.0	GP-GM	56	33	11	0.07														
		B-13	22.0-27.0	SM	40	42	18	0.034														
		J-17R	32.0-33.5	CL	6	27	67	0.001	24	38												
		B-23	42.0-45.0	SM	30	48	22	0.026														
		B-28	49.0-51.7	SP-SM	42	47	11	0.068														
		B-38	62.5-63.5	SM	42	45	13	0.05														
FD-19	457.7	B-4	1.6- 5.0	GM	44	43	13															
		B-8	8.7-11.6	SM	21	65	14															

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL.	PERM.	
FD-20	435.1	B-6	6.1-10.0	SM	24	61	15															
		B-8	10.0-15.0	SM	40	46	14	0.05														
		B-14	23.5-25.0	GP-GM	66	26	8	0.12														
		B-17	30.0-35.0	GP-GM	69	25	6	0.16														
		B-20	40.0-45.0	GP-GM	55	40	5	0.16														
FD-24	469.4	B-6	11.0-15.0	SP-SM	32	60	8	0.09														
		B-10	20.0-25.0	GM	43	38	19	0.035														
		J-13R	25.0-30.0	SM								14.7	15.0									
		J-14R	30.0-35.0	SM	15	41	44	0.0028														
		J-15R	30.0-35.0	SM								11.3	12.4									
		J-20R	40.0-45.0	SM								11.0	12.3									
		J-22R	45.0-50.0	SM								10.1	12.4									
		B-23	50.0-55.0	GM	36	33	31	0.008														
		J-28R	60.0-65.0	SM								10.6	11.5									
FD-25	533.4	B-5	5.0- 7.3	SM	19	63	18	0.044														
FD-26	553.8	B-8	10.0-15.0	SM	28	52	20	0.035														
FD-27	505.6	B-5	5.0- 8.8	SM	19	48	33	0.017														
FD-28	479.9	B-5	5.0- 9.0	SM	29	49	22	0.032														
FD-29	499.9	B-4	4.1- 7.0	SM	38	47	15															
FD-30	502.7	B-3	3.0- 5.0	SM	23	65	12															
		B-11	14.0-19.0	SM	35	39	26	0.024														
		B-29	52.0-53.3	SM	19	38	43	0.003														
		B-45	76.2-77.0	SM	15	60	25	0.017														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.	
FD-31	504.4	B-3	5.0-10.0	GP-GM	50	44	6	0.14														
		B-14	30.0-35.0	SM	24	31	45	0.0022														
		B-27	52.0-54.0	SM-SC	11	43	46	0.0025	19	23												
		B-35	70.0-73.0	SM-SC	22	40	38															
		B-46	96.0-97.0	GP-GM	71	23	6	0.14														
		J-47R	96.0-97.0	SM	10	46	44	0.015														
FD-35	557.8	B-4	2.4- 5.0	SM	22	58	20	0.033														
FD-36	443.3	B-5	5.4- 7.7	GP-GM	56	37	7	0.13														
FD-37	442.4	B-7	5.0- 7.4	GP-GM	48	46	6	0.13														
FD-39	481.1	B-5	5.0- 8.3	SP-SM	39	49	12	0.07														
		B-9	10.0-13.5	SM	12	48	40	0.019														
FD-42	555.0	B-5	5.0-10.0	SM	32	47	21	0.029														
FD-44	529.9	B-1	1.8- 4.4	SM	29	50	21	0.041														
		B-6	8.0-12.0	SM	38	47	15	0.05														
		B-13	19.0-23.0	SM-SC	24	28	48	0.0034														
		J-14R	19.0-23.0	SM					19	24												
		B-16	25.0-28.4	SM	30	35	35	0.006														
FD-46	588.9	B-5	2.1- 5.0	SM	22	50	28	0.025														
		B-11	10.9-15.0	SM	40	42	18	0.041														
		B-13	15.0-19.0	ML	9	41	50	0.009	w/1" Silt Strata													
		B-15	20.0-24.3	SM	25	55	20	0.033														
		B-17	25.0-28.0	GP-GM	56	35	9	0.082														
		B-23	35.0-39.2	SM	37	42	21	0.041														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST SUMMARY DATA

EXPL NO.	TOP ELEV FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			*	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 E	PL	LL		TOTAL	NO4	OPT WATER % DRY WT	MAX DRY DENS LBS/CU FT	PVC LBS/CU FT		TOTAL	NO4	SHEAR	CONSOL	PERM
FD-47	560.3	J-4	2.6- 3.2	GP-GM	46	43	11	0.073														
		J-9	10.7-12.1	SM	20	61	19	0.04														
		J-17	28.0-29.6	SM	20	48	32	0.026														
		J-24	41.6-42.3	ML	5	40	55	0.023														
FD-48	559.2	B-7	5.6-10.0	SM	19	52	29	0.025														
FD-49	593.0	B-3	2.3- 4.4	SM	17	55	28	0.023														
		B-9	11.3-15.0	SM	27	54	19	0.041														
		J-14	17.6-19.1	SM	0	52	48	0.02														
FD-50	564.8	B-4	5.0-10.0	GP-GM	59	31	10	0.074														
		B-8	15.0-18.0	SM	14	51	35	0.019														
		B-12	25.0-28.0	SM	27	40	33	0.017														
		B-19	49.0-52.0	SM	9	41	50	0.013														
FD-51	546.6	B-3	2.6- 5.0	SM	6	54	40	0.014														
		B-9	11.0-15.0	SM	20	65	15	0.043														
		B-14	20.0-25.0	SM	26	60	14	0.059														
		B-19	30.0-31.0	SM	9	58	33	0.014														
FD-52	553.7	B-8	6.4-10.0	GM	39	38	23	0.028														
		J-19	25.0-26.1	SM	14	63	23	0.037														
		J-23	30.0-31.7	SM	1	70	29	0.03														
		B-27	35.0-37.0	SP-SM	0	89	11	0.07														
		B-32	43.0-45.0	SM	18	48	34	0.033														
		B-41	55.0-56.3	SM	33	48	19	0.041														
FD-53	546.7	B-3	2.5- 5.0	SM	4	47	49	0.0088														
		B-9	7.6- 8.8	SM	18	47	35	0.016														
		B-16	16.0-21.0	SM	9	76	15	0.06														
		B-20	26.0-28.2	SM	25	58	17	0.058														

* PROVIDENCE VIBRATED DENSITY TEST.

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 E.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
FD-53 Cont'd	546.7	J-22	30.0-31.4	ML	3	42	55	0.02													
		B-30	40.0-41.4	SM	23	48	29	0.017													
		B-37	49.0-50.0	SM	3	51	46	0.0052													
FD-54	571.5	B-4	1.0- 5.0	SM	40	49	11	0.07													
		B-8	6.0-10.0	SM	14	72	14	0.05													
		B-18	19.0-22.1	SM	15	72	13	0.055													
		B-22	26.0-29.5	SM	1	62	37	0.03													
		B-27	39.0-40.6	SM	37	47	16	0.049													
		B-32	46.0-48.0	SM	19	47	34	0.026													
FD-55	456.2	B-8	10.0-15.0	SP-SM	19	73	8	0.11													
		B-13	21.0-25.0	SM	36	50	14	0.05													
		B-18	32.0-35.0	SP-SM	41	48	11														
		J-19R	35.0-36.5	SM	42	45	13														
		B-24	40.0-43.0	GM	51	37	12	0.054													
		B-26	43.0-45.0	SM	18	45	37	0.0078													
		J-28R	46.0-49.0	SM					Non-Plastic												
FD-56	561.2	B-11	6.0-8.0	SM	26	60	14	0.05													
		B-16	11.6-14.0	SM	28	52	20	0.041													
		B-25	19.0-22.0	SM	2	61	37	0.027													
		J-29	25.7-26.7	SM													109.4	(plug)			
		B-30	25.7-26.7	SM	8	54	38	0.027													
		B-37	35.0-37.9	SP-SM	34	60	6	0.14													
		B-42	42.0-44.0	GP-GM	46	44	10	0.1													
		B-46	48.0-50.0	SM	37	48	15														
FD-57	570.0	B-5	5.0-10.0	SM	39	46	15	0.049													
		B-15	25.0-29.0	SM	1	55	44	0.025													
		J-16	29.0-31.0	SM													106.8	(plug)			

* PROVIDENCE VIBRATED DENSITY TEST.

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D.Q. mm.	P L	L L		TOTAL	-NO4	OPT. WATER % DRY WT	MAX DRY DENS LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM
FD-57	570.0	J-24	37.0-39.0	SM	w/occ. silt strata to 1/2"												111.5	(plug)			
Contd		B-27	39.0-41.0	SP-SM	3	88	9	0.08													
		B-33	47.0-48.4	SM	5	78	17	0.05													
		J-34	49.0-50.0	SM	0	80	20	0.04													
FD-59	438.3	J-6R	5.8-10.0	GP-GM	51	39	10	0.074													
		J-11R	15.0-20.0	GP-GM	51	38	11	0.07													
		B-16	25.0-27.0	SM	39	48	13														
		B-22R	38.0-39.5	SM	31	37	32														
		B-26	41.5-44.8	SM	39	47	14														
FD-63	455.8	B-6	7.0- 9.4	GP-GM	47	46	7	0.11													
		B-9	10.0-14.2	SM	11	58	31														
		B-13	15.0-20.0	SM	41	46	13														
		B-17	22.2-25.0	GM	55	30	15														
		B-22	40.0-45.0	SM	23	39	38														
		B-27	50.0-52.3	SM	23	44	33														
		B-32	56.0-57.7	GP-GM	53	37	10	0.074													
FD-64		B-3	0.6- 3.8	GP-GM	62	32	6	0.14													
		B-9	10.0-15.0	SM	41	44	15														
		B-13	18.8-23.8	GM	43	40	17														
		B-19	30.0-35.0	SM	15	40	45														
		B-27	42.4-47.0	SM	13	38	49														
FD-65	438.73	B-8	7.5-10.0	GP-GM	51	40	9	0.08													
		B-17	25.0-27.4	GP-GM	56	37	7	0.11													
		B-28	39.0-41.2	SP-SM	35	58	7	0.1													
		J-30	47.7-51.4	SM	29	49	22														
		J-32	52.7-53.1	SM	15	62	23														

* PROVIDENCE VIBRATED DENSITY TEST.

TEST SUMMARY DATA

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO		* PVD LBS/CU FT	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT		TOTAL	-NO4	SHEAR	CONSOL.	PERM.
FT-4	571.4	B-3	2.6- 8.0	SM	32	34	34	0.018													
FT-5	573.8	B-3	2.9- 8.0	SM	21	55	24	0.028													
FT-6	497.4	B-3	3.0-13.0	SM	39	41	20	0.031													
FT-7	508.4	B-3	2.9-12.0	SM	40	45	15	0.043													
FT-8	474.7	B-3	2.9-11.0	GP	49	47	4	0.29													
		B-5	11.0-13.0	GM	48	40	12	0.07													
FT-9	441.3	B-1	0.5- 5.8	SM	0	71	29														
FT-9	441.3	B-3	5.8-10.0	GP-GM	53	40	7	0.11													
FT-10	442.2	B-3	6.0-10.0	GM	50	37	13	0.054													
FT-11	438.3	B-3	5.5- 7.0	SP-SM	46	48	6	0.13													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} E.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
BD-10	695.5	J-3R	0.6- 5.0	SM									11.5								
		B-4	5.0- 7.1	SM	11	44	45	0.0052	Non-Plastic												
		J-5R	5.0- 7.1	SM									12.7								
		J-6	7.1-10.0	SM									11.5								
		B-7	10.0-12.4	ML-CL	9	33	58	0.0019	17	22	2.80										
		J-8R	10.0-12.4	ML-CL									12.0								
		J-9	12.4-15.0	ML-CL	13	33	54	0.003				11.5	12.0								
		B-12	17.0-17.8	ML-CL	9	36	55	0.0017													
		J-13R	17.0-17.8	ML-CL								12.1	12.8								
		J-16R	20.0-22.7	SM-SC								8.0	9.6								
		J-18R	22.7-25.0	SM-SC					18	23		9.6	9.9								
		J-21R	28.0-30.0	SM-SC								8.0	9.2								
		B-22	30.0-32.6	SM	23	31	46	0.0026	Non	Plas.	2.84										
		J-23R	30.0-32.6	SM								8.8	9.2								
		J-25R	32.6-35.4	SM								8.3	8.7								
		J-27R	38.0-38.6	SM								10.1	10.2								
		J-29R	40.0-40.6	SM								9.0	9.2								
		J-31R	42.0-43.0	SM					Non	Plastic		9.1	9.4								
		J-32R	43.0-44.2	SM								9.3	9.6								
		B-34	46.0-48.8	SM	20	36	44	0.005	Non	Plastic											
		J-35R	46.0-48.8	SM								8.6	8.8								
		B-39	53.0-55.0	SM	16	37	47	0.0049	"	"	2.82										
		J-40R	53.0-55.0	SM								9.1	9.6								
		J-42R	55.0-57.0	SM								6.9	7.8								
		J-44R	57.7-60.0	SM								9.3	10.5								
		B-47	65.0-70.0	GM-GC	34	28	38	0.0049	16	21											
		J-48R	65.0-70.0	SM-SC								9.5	10.0								
		J-51R	70.8-73.3	SM-SC								10.2	10.4								

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

EXPL. NO.	TOP ELEV FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	D 10 MM	ATT. LIMITS PL	LL	SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT TOTAL	NO4	COMPACTION DATA STND AASHO OPT WATER % DRY WT	MAX DRY DENS LBS/CU FT	* PVD LBS/CU FT	NAT. DRY DENSITY LBS/CU FT TOTAL	NO4	OTHER TESTS SHEAR	CONSOL	PERM.
BD-11	731.1	B-3	1.6- 5.0	ML	7	37	56	0.0028	19	20	2.82										
		J-4R	1.6- 5.0	ML								14.4	14.5								
		J-6R	5.0- 8.3	SM								14.3	14.6								
		B-8	10.9-15.0	SM	18	35	47	0.0043	Non Plastic												
		J-12R	17.4-18.2	SM								10.8	11.8								
		B-14	20.0-21.3	SM	26	31	43	0.0043	18	21											
		J-15R	20.0-21.3	SM								12.1	13.1								
		J-17R	21.3-25.0	SM								10.7	11.1								
		B-18	25.0-30.0	SM	24	31	45	0.0024	18	21	2.80										
		J-19R	25.0-30.0	SM								10.7	11.5								
		J-21R	30.0-31.1	ML								14.0	14.4								
		J-23R	31.1-35.0	SM								9.3	11.0								
		B-24	35.0-37.7	SM	29	28	43	0.0021	18	21											
		J-25R	35.0-37.7	SM								9.9	11.6								
		J-26	37.7-40.0	SM								11.8	12.5								
		J-28R	40.0-44.4	SM-SC								9.9	10.8								
		J-31R	46.0-50.0	SM-SC								10.1	11.5								
		B-32	50.0-55.0	SM-SC	23	32	45	0.002	18	22											
		J-33R	50.0-55.0	SM-SC								14.5	15.1								
		J-35R	55.0-58.0	SM-SC								12.4	13.3								
		J-37R	58.5-60.0	SM-SC								14.9	15.6								
		B-38	60.0-65.0	SM-SC	23	30	47	0.012													
		J-39R	60.0-65.0	SM-SC								11.9	12.4								
		J-41R	65.0-70.0	SM-SC								10.4	13.3								
		J-43R	70.0-75.0	SM-SC								9.8	11.5								
		J-45R	75.0-80.0	GM-GC								12.6	17.1								
		J-47R	80.0-85.0	SM-SC								13.1	14.9								
		B-48	85.0-89.0	SM-SC	26	34	40	0.002													
		J-49R	85.0-89.0	SM-SC								9.4	10.6								
		J-51R	89.0-90.0	SM-SC								9.9	10.3								
		J-53R	90.0-95.0	SM-SC								10.8	11.3								
		J-55R	95.0-96.4	SM-SC								9.9	10.5								
		B-44	75.0-80.0	GM-GC	28	27	45	0.0011	18	24											

* PROVIDENCE VIBRATED DENSITY TEST

LITTLEVILLE DAM

TEST SUMMARY DATA

EXPL NO	TOP ELEV FT	SAMPLE NO	DEPTH FT	SOIL SYMBOL	MECHANICAL ANALYSIS GRAVEL %	SAND %	FINES %	D_{10} mm	ATT LIMITS PL	LL	SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT TOTAL	- NO4	COMPACTION DATA STND AASHO OPT WATER % DRY WT	MAX DRY DENS LBS/CUFT	* PVD LBS/CUFT	NAT DRY DENSITY LBS/CUFT TOTAL	- NO4	OTHER TESTS SHEAR	CONSOL	PERM
B-11 Continued																					
		B-57	97.8-100.0	SM-SC	22	36	42	0.002	15	20											
		J-58R	97.8-100.0	SM-SC								9.6	11.1								
		J-60R	100.0-105.0	"								8.0	8.9								
		B-61	105.0-110.0	"	16	41	43	0.0013													
		J-62	110.0-115.0	"								9.3	9.9								
		J-64R	110.0-115.0	"								15.1	15.5								
		B-65	115.0-120.0	"	13	45	42	0.0021	16	21											
		J-66R	115.0-120.0	"								13.9	14.3								
		J-68R	120.0-122.1	"								15.1	17.7								

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL NO	TOP ELEV FT	SAMPLE NO	DEPTH FT	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT DRY DENSITY LBS/CUFT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D10 E	PL	LL		TOTAL	NO4	OPT WATER % DRY WT	MAX DRY DENS LBS/CUFT	PVD * LBS/CUFT	TOTAL	NO4	SHEAR	CONSOL	PERM
BD-12	751.5	J-2R	1.2- 3.1	SM								20.3	21.9								
		J-4R	3.1- 5.0	SM								13.0	14.9								
		J-6R	5.0- 9.4	SM								10.6	14.0								
		B-7	5.0- 9.4	SM	26	49	25	0.026													
		J-8R	9.4-10.0	SM								11.4	11.8								
		J-9R	10.0-13.0	SM								12.1	12.5								
		B-10	10.0-13.0	SM	11	42	47	0.0036	Non Plastic												
		J-11R	13.0-15.0	GM								8.1	8.5								
		J-13R	15.0-19.0	ML								9.4	9.9								
		B-14	15.0-19.0	ML	10	38	52	0.002													
		J-15R	19.0-20.0	ML								9.6	10.8								
		J-17R	20.0-23.0	ML								9.5	10.8								
		J-19R	23.0-25.0	ML								9.9	10.9								
		J-21R	25.0-26.0	ML								10.6	11.1								
		J-23R	26.0-28.7	ML								8.1	9.7								
		B-24	26.0-28.7	ML	11	37	52	0.002	16	19											
		J-26R	30.0-31.8	ML								9.3	10.1								
		J-29R	32.4-35.0	ML								8.9	10.7								
		B-31	35.0-37.8	ML-CL	16	33	51	0.001													
		J-32R	37.8-40.0	ML-CL								9.5	9.9								
		B-35	40.0-43.0	ML-CL	11	35	54	0.001	17	22											
		J-36R	43.0-45.0	ML-CL								8.2	8.7								
		B-39	45.0-48.2	SM-SC	19	32	49	0.0012	17	24											
BD-14	628.2	J-3R	3.0- 5.0	GM								14.9	17.0								
		B-4	5.0-10.0	ML	14	35	51	0.005	20	21											
		J-4R	5.0-10.0	ML								13.1	14.5								
		B-5	10.0-15.0	ML	13	34	53	0.0025	19	22											
		J-5R	10.0-15.0	ML								14.3	14.5								
		J-6R	15.0-20.0	SM-SC								10.6	12.6								
		B-7	20.0-25.0	SM-SC	24	29	47	0.0017	18	22											

* PROVIDENCE VIBRATED DENSITY TEST.

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO			NAT. DRY DENSITY LBS/CUFT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	- NO 4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	PVD * LBS/CU FT	TOTAL	- NO 4	SHEAR	CONSOL.	PERM.
BD-14	Continued																				
		J-7R	20.0-25.0	SM-SC								11.6	12.3								
		B-9	30.0-35.0	SM-SC	24	36	40	0.0038	17	21											
		J-9R	30.0-35.0	SM-SC								9.2	11.1								
		J-10R	35.0-40.0	SM-SC								9.1	12.3								
		J-8R	25.0-30.0	SM-SC								8.8	10.0								
BD-15	609.0	J-6R	7.2-10.0	SM								15.2	15.7								
		B-7	7.2-10.0	SM	13	41	46	0.0042	20	22											
		J-8R	10.0-12.5	SM								19.4	22.0								
		J-11R	15.0-20.0	GM								13.0	13.7								
		B-12	15.0-20.0	GM	41	27	32	0.008	18	21											
		J-13R	20.0-24.0	SM-SC								8.7	9.0								
		B-14	20.0-24.0	SM-SC	18	37	45	0.0021	16	21											
		J-16R	24.0-25.0	SM-SC								9.4	9.7								
		J-17R	25.0-28.0	SM								10.0	10.8								
		J-20R	30.0-33.0	SM								10.6	11.3								
		B-21	30.0-33.0	SM	7	51	42	0.006	Non Plastic												
		J-22R	33.0-33.9	SM								9.2	10.7								
		J-25R	35.7-40.0	SM-SC								8.7	9.3								
		B-26	35.7-40.0	SM-SC	12	45	43	0.003	17	22											
BD-16	770.1	B-5	5.0-10.0	GM	33	29	38	0.0095	Non Plastic												
		J-6R	10.0-15.0	SM								11.9	12.3								
		J-9R	16.0-20.0	ML								7.8	8.4								
		B-10	16.0-20.0	ML	10	33	57	0.0012													
		J-11R	20.0-25.0	SM								9.2	9.3								
		J-13R	25.0-29.2	SM								9.1	9.2								
		J-18R	32.0-35.0	SM								10.3	10.9								
		B-19	32.0-35.0	SM	15	42	43	0.004	Non Plastic												
		J-20R	35.0-38.0	SM								11.0	11.1								
		J-22R	38.0-40.0	SM								11.6	11.8								
		J-24R	40.0-45.0	SM								8.5	9.3								
		J-26	45.0-48.0	SM								7.9	8.6								

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND. AASHO		* PVD LBS/CU FT	NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	- NO 4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT		TOTAL	- NO 4	SHEAR	CONSOL	PERM.	
BD-16 Continued																						
		B-27	45.0-48.0	SM	17	40	43	0.0034														
		J-30R	51.3-53.1	SM								8.5	9.5									
		J-34R	55.0-58.0	SM								9.1	9.7									
		B-35	55.0-58.0	SM	19	37	44	0.0025	Non Plastic													
		J-36R	58.0-60.0	SM								8.3	9.1									
		J-38R	60.0-62.0	SM								7.9	9.0									
		J-40	62.0-65.0	SM								9.3	10.5									
		B-41	62.0-65.0	SM	20	42	38	0.0041														
		J-43R	67.0-69.3	SM								7.9	9.3									
		J-46	73.4-75.0	SM								8.9	9.5									
		B-48	75.0-76.5	SM	18	50	32	0.0062	Non Plastic			9.1	10.3									
BD-17	747.8	J-3R	2.7- 5.0	SM								18.8	21.1									
		B-6	5.0-10.0	SM	31	45	24	0.025	Non Plastic													
		J-7R	10.0-15.0	SM								13.1	13.4									
		B-10	15.0-20.0	SM	15	43	42	0.006														
		J-11R	20.0-25.0	SM								8.8	9.2									
		B-14	25.0-30.0	SM	17	47	36	0.014														
		J-15R	30.0-32.0	SM								8.5	9.1									
		J-17R	32.0-34.2	SM								8.0	8.1									
		J-20R	35.0-37.0	SM								9.6	10.7									
		B-21	35.0-37.0	SM	19	44	37	0.0071	Non Plastic													
		J-24R	38.8-40.0	SM								14.7	18.3									
		J-25R	40.0-41.7	SM								15.7	15.9									
		J-26	40.0-41.7	SM	9	55	36	0.016														
		J-27	41.7-43.0	SM								15.7	17.2									
BD-18	465+	B-5	5.0-10.0	SP-SM	44	45	11															
		B-7	10.0-15.0	SP-SM	27	64	9	0.088														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA			NAT. DRY DENSITY LBS/CUFT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} E.	PL	LL		TOTAL	-NO4	STND AASHO OPT. WATER % DRY WT	STND AASHO MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
BD-19	460±	B-2	1.4- 5.0	GP-GM	58	34	8	0.09													
		B-10	15.0-20.0	GM	49	39	12														
		B-12	20.0-25.0	SP-SM	26	67	7	0.094													
BD-20	455±	B-4	5.0-10.0	GP-GM	53	37	10	0.074													
		B-6	10.0-15.0	SP-SM	33	56	11														
BD-21	454±	B-8	5.0-10.0	GM	52	36	12														
BD-22	450±	B-7	5.0-10.0	GP	66	30	4	0.24													
		B-9	10.0-14.3	GP-GM	47	42	11														
		B-12	15.0-17.0	SM	6	66	28														
		B-16	20.0-25.0	GP-GM	62	30	8	0.09													
BD-23	445±	B-2	0.0-5.0	SM	0	80	20														
		B-5	5.6-10.0	GP-GM	55	37	8	0.091													
		B-9	15.0-20.0	GP-GM	53	36	11														
BD-24	465±	B-6	5.0- 9.6	GP	57	38	5	0.19													
		B-9	10.0-13.4	GW-GM	53	42	5	0.17													
BD-27	467±	B-4	5.0- 7.8	SP-SM	27	65	8	0.1													
		B-8	10.0-15.0	GW-GM	48	41	11														
BD-28	475±	B-9	10.0-13.9	GP-GM	64	28	8	0.1													
BD-29	472±	B-3	5.0-10.0	GP-GM	64	31	5	0.2													
BD-31	490±	B-8	6.2-10.0	GP-GM	56	36	8	0.1													
		B-10	10.0-13.5	GW-GM	55	39	6	0.15													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CUFT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} E.	PL	LL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX. DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.
BT-3	690±	B-2	3.4-11.4	SM	17	38	45	0.0044	20	21	2.80			11.9	123.1						
		UC-4	3.4-11.4									12.5	14.1				125.9				
		UC-6	3.4-11.4									13.2	14.6				121.4				
		UC-8	3.4-11.4									15.6	16.6				113.8				
		UC-10	3.4-11.4									13.6	15.1				119.5				
		B-11	11.4-15.0	SM	20	31	49	0.0025	18	21	2.82			10.5	127.3						
		UC-12	11.4-15.0									13.2	14.8				122.3				
		UC-14	11.4-15.0									12.8	15.0				125.1				
		UC-18	11.4-15.0									12.5	11.9				125.8				
		UC-22	11.4-15.0									11.2	12.4				130.4				
BT-4	456.2	B-2	2.7- 8.1	GP	68	29	3	0.42													
		B-3	9.7-12.3	SP	46	50	4	0.15													
BT-5	459.6	B-2	2.2- 8.5	GP-GM	68	22	10	0.74													
		B-3	8.5-10.6	SP	2	95	3	0.13													
		B-4	10.6-12.0	SP	32	65	3	0.16													
BT-6	462.1	B-2	3.1-11.6	GP	63	35	2	0.42													
BT-7	464.0	B-2	1.5- 7.2	SP	47	49	4	0.16													
		B-3	7.2- 8.3	ML	0	50	50														
		B-4	8.3-10.5	SP-SM	36	55	9	0.08													
BT-8	468.3	B-2	2.1- 9.6	SM	34	50	16														
BT-9	460.3	B-2	2.3- 3.5	GP	56	41	3	0.21													
		B-3	3.5- 4.8	SP	0	98	2	0.20													
		B-4	4.8-11.2	GP	55	40	5	0.15													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

TEST DATA SUMMARY

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT WATER CONTENT % DRY WT		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS		
					GRAVEL %	SAND %	FINES %	D_{10} mm.	PL	LL		TOTAL	- NO4	OPT. WATER % DRY WT	MAX DRY DENS. LBS/CU FT	* PYD LBS/CU FT	TOTAL	- NO4	SHEAR	CONSOL	PERM.
BT-10	458.2	B-3	3.9-10.0	GP-GM	51	42	7	0.13													
BT-11	453.8	B-2	3.9- 9.6	GP	60	36	4	0.17													
BT-12	481.4	B-2	2.3- 7.4	SP	28	68	4	0.21													
		B-3	7.4-11.5	SM	12	61	27														
BT-13	475.9	B-1	0.6- 9.5	GP	70	29	1	0.7													
BT-14	477.3	B-1	0.8- 3.7	SM	0	84	16														
		B-2	3.7-10.6	GP	58	40	2	0.4													
BT-15	491.5	B-2	2.3- 3.8	GP	65	31	4	0.17													
		B-3	3.8- 7.1	GP	57	39	4	0.19													
		B-4	7.1-10.5	GP-GM	62	33	5	0.14													
BT-18	477.6	B-3	5.1- 7.0	GP	65	33	2	0.56													
		B-4	7.1-10.6	GP	59	38	3	0.3													
BT-19	475.2	B-2	5.1- 7.0	GP	63	35	2	0.6													
		B-3	7.0-11.0	SP-SM	41	53	6	0.12													
BT-20	480.2	B-1	0.6- 2.9	SP-SM	10	81	9	0.09													
		B-2	2.9- 6.2	GP	60	39	1	0.5													
		B-3	6.2-14.0	GP	64	34	2	0.56													
BT-21	470.6	B-1	0.6- 2.0	GP	69	29	2	0.47													
		B-2	2.1- 5.2	SP-SM	0	88	12														
		B-3	5.2- 6.8	GP	74	25	1	0.79													
		B-4	6.8-11.7	GP	61	36	3	0.21													

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

EXPL. NO.	TOP ELEV. FT.	SAMPLE NO.	DEPTH FT.	SOIL SYMBOL	MECHANICAL ANALYSIS				ATT. LIMITS		SPECIFIC GRAVITY	NAT. WATER CONTENT % DRY WT.		COMPACTION DATA STND AASHO			NAT. DRY DENSITY LBS/CU FT		OTHER TESTS			
					GRAVEL %	SAND %	FINES %	D_{10} mm.	LL	PL		TOTAL	-NO4	OPT. WATER % DRY WT	MAX DRY DENS. LBS/CU FT	* PVD LBS/CU FT	TOTAL	-NO4	SHEAR	CONSOL	PERM.	
BT-22	488.5																					
		B-2	2.5- 6.0	GP	63	34	3	0.35														
		B-3	6.1- 8.0	GP	65	32	3	0.26														
		B-4	8.4-13.2	GP-GM	54	40	6	0.22														
BT-23	492.1	B-2	2.8- 9.3	GP-GM	52	41	7	0.17														
BT-24	477.5	B-2	4.3- 7.8	GP	66	33	1	0.69														
		B-3	7.8-12.3	GP	59	38	3	0.28														
BT-25	474.3	B-1	0.4- 2.0	GP	59	38	3	0.46														
		B-2	2.1- 2.8	SP-SM	0	98	8	0.09														
		B-3	3.2- 5.4	GP	60	37	3	0.46														
		B-4	5.4-11.9	GP	68	29	3	0.5														
BT-26	479.7	B-2	4.9- 7.6	GP	81	17	2	5.1														
		B-3	7.6-10.8	SP-SM	44	50	6	0.13														
BT-27	482.6	B-2	3.4- 5.3	GP-GM	49	46	5	0.095														
		B-3	5.3- 9.8	GP-GM	57	36	7	0.15														
BT-28	472.9	B-2	3.2- 7.0	SP	48	50	2	0.35														
		B-3	7.0-10.8	GP	55	43	2	0.28														

* PROVIDENCE VIBRATED DENSITY TEST.

LITTLEVILLE DAM

SECTION 1

PREPARATION OF SITE
(ITEM 1)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
1-01	Scope	1-1
1-02	Removal of Existing Structures	1-1
	a. General	1-1
	b. Disposal	1-1
1-03	Clearing and Grubbing	1-1
	a. General	1-1
	b. Clearing	1-1
	c. Grubbing	1-2
	d. Disposal	1-2
1-04	Payment	1-2

SECTION 1

PREPARATION OF SITE (ITEM 1)

1-01. SCOPE. - Work covered by this section of the specifications consists in furnishing all plant, labor, equipment, and appliances and in performing all operations in connection with the preparation of the various sites of work, except the borrow areas, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract. Clearing of reservoir is not included under the contract.

1-02. REMOVAL OF EXISTING STRUCTURES. - a. General. - The contractor shall remove all structures and all fences and above ground stone walls within the areas (as specified in Paragraph 1-03) to be cleared. All structures to be removed are indicated on the contract drawings. All basements, cisterns, walls, etc., outside of the Permanent Works and within the work limits, shall be filled.

b. Disposal. - The structures removed under this paragraph of the specifications shall become the property of the contractor, and shall be removed in their entirety off the site of the work or disposed of in designated waste areas as directed. Stone, subject to approval, may be salvaged and used in the permanent work.

1-03. CLEARING AND GRUBBING. - a. General. - Clearing shall consist of the satisfactory felling and removal of all trees and vegetation (except grass) together with down timber, snags, brush and rubbish occurring within the limits of the areas to be cleared. Grubbing shall consist of the below ground removal and disposal of all natural growth, buried logs, down timber, brush, snags and other objectionable material and vegetation other than grass and leaves from the areas specified.

b. Clearing. - The areas to be cleared shall include all existing uncleared areas at the site of all new permanent works, graded areas, and spoil areas, together with a 10 foot strip (unless otherwise specified) measured horizontally beyond and contiguous thereto for the foundation areas for dam and dike and all other fill areas, and a 5 foot strip measured horizontally beyond and contiguous thereto for all cut sections and as indicated for the log boom, and to the limits shown on the drawings. The width of the strip to be cleared beyond the foundation area of the dam shall be 50 feet on the downstream side and 100 feet on the upstream side, both measured horizontally. Where indicated on the drawings, all existing slopes steeper than 1 on 3 shall be cut back to 1 on 3 in cleared area below Elevation 520. Where grubbing is not specified or required, stumps shall be left not more than 6 inches higher than the existing ground.

c. Grubbing. - The areas to be grubbed include the foundation areas for the dam and dike and the areas of all cuts. The areas of the fill for the road relocation whenever the fills are 3 feet or less in height shall be grubbed. Also included in areas to be grubbed are the areas of a strip 10 feet wide to be measured horizontally and contiguous to the above described areas to be grubbed and areas of a strip 5 feet wide to be measured horizontally and contiguous to the limits of all cut Sections. In grubbing out stumps, all tap and lateral roots or other growth over 1-1/2-inches in diameter shall be removed to a depth of 1-1/2-feet below the stripping line in areas to be stripped and to a depth of 1 foot below the ground surface in grubbing areas not to be stripped. In stripping areas within previously wooded areas, as determined by the Contracting Officer, roots with a diameter greater than 1/2-inch shall be removed for a depth of 8 inches by the use of an approved root raker or scarifier after the stripping operations are completed. The rooting or scarifying operation shall be repeated as often as considered necessary by the Contracting Officer to insure satisfactory removal of roots. After each operation, exposed roots on the surface shall be removed prior to the succeeding operation.

d. Disposal. - All materials removed during the clearing and grubbing operations shall be disposed of by burning or removal to approved disposal areas outside of the reservoir area, unless otherwise authorized, except that merchantable timber shall become the property of the contractor and shall be removed from the site of the work. No material shall be thrown into or left along the banks of the river. The disposal of material shall closely follow the removal thereof so that in case of high water, a minimum of debris and brush will be washed downstream. At no time shall such material be placed on land outside the work areas. The contractor shall be responsible for compliance with all Federal and State Laws and regulations relative to the building of fires. Disposal by burning shall be under constant attendance until fires have burned out or have been extinguished. Whenever Elm trees are cut, all portions of the trees which are neither buried as directed or burned shall be thoroughly sprayed with a two percent emulsion of DDT.

1-04. PAYMENT. - Except as noted below, payment for all work in connection with the preparation of site as specified above will be made at the contract lump sum price for Item No. 1, "Preparation of Site". The lump sum price shall reflect the salvage value of the merchantable timber to be removed. Payment for clearing borrow areas shall be included in the applicable contract unit price for unclassified excavation in borrow areas. Payment for filling holes due to removal of stumps, and existing structures within the limits of the areas to be grubbed will be paid for at the applicable contract price for the type of fill material used.

SECTION 2

CONTROL AND DIVERSION OF WATER
(ITEM 2)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
2-01	Scope	2-1
2-02	Diversion Plan	2-1
2-03	Auxiliary and Temporary Upstream and Downstream Cofferdams	2-1
2-04	Materials	2-2
	a. Permanent Cofferdams	2-2
	b. Auxiliary and Temporary Cofferdams	2-2
2-05	Overtopping of Permanent Cofferdams	2-2
2-06	Payment	2-2

SECTION 2

CONTROL AND DIVERSION OF WATER
(ITEM 2)

2-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all plant, labor and appliances, and in performing all operations in connection with diverting and controlling the river and dewatering the construction areas within the limits of permanent works or structures, so that these structures may be constructed in the dry, unless otherwise specified, all in accordance with this section of the specifications. The work under this section shall also include the installation of well points, wells, etc., to lower the water table as specified in Section 3, "EXCAVATION - OPEN CUT".

2-02. DIVERSION PLAN. - The plan of diversion provides for the placement of all embankment material in the dam and dike in the dry. Operations shall be accomplished in sequence as follows:

a. The first stage of the work shall consist of the construction of the water supply pipe and diversion conduit and the completion of the lower portion of the water supply intake up to Elevation 505 msl. Upon completion of the foregoing and the relocation of East River Road, auxiliary cofferdams shall be constructed, the river diverted through the conduit, and the foundation area of the dam embankment dewatered. The relocation of East River Road will be completed by others on or about 1 August 1963.

b. After the diversion of the river, the contractor shall complete the initial excavation for the foundation cut-off for the dam within the limits shown on the drawings; construct the grout curtain in the excavated portion of the cut-off trench; prepare the bedrock surface exposed in the trench in accordance with Section 3, "EXCAVATION - OPEN CUT"; and place impervious fill in the trench in the valley up to a level 5 feet above the level of the adjacent ground after stripping in accordance with Section 7, "EMBANKMENTS". In connection with the foregoing, attention is directed to the provisions of Section 3, "EXCAVATION - OPEN CUT" which require that well points, wells, and similar devices be employed during the initial excavation of the foundation cut-off so that all work may be done in the dry.

c. After completion of the work outlined in b. above, the contractor shall proceed to construct the permanent cofferdam to Elevation 505 msl. All material for the permanent cofferdam, including rock slope protection, shall be placed in the dry.

2-03. AUXILIARY AND TEMPORARY UPSTREAM AND DOWNSTREAM COFFERDAMS. - Auxiliary and temporary upstream and downstream cofferdams shall be

designed and constructed by the contractor who shall select the location, type of construction and height. Any damage to permanent work resulting from overtopping or other failure of such structures or by flooding shall be repaired by the contractor at his own expense and at no additional cost to the Government.

2-04. MATERIALS. - a. Permanent Cofferdam. - All material placed within the limits of the permanent cofferdam shall conform to the requirements of Sections 3, 7 and 8 and shall remain in place to form part of the permanent work, in which case payment will be made to the applicable payment lines. Payment for stripping for permanent cofferdam will be measured and paid for under Section 3, "UNCLASSIFIED EXCAVATION - GENERAL".

b. Auxiliary and Temporary Cofferdams. - No payment will be made for stripping foundation areas of auxiliary and temporary cofferdams and for furnishing and placement of any cofferdam material used in auxiliary and temporary cofferdams. The contractor will not be permitted to use any material from required excavations and from borrow in auxiliary and temporary cofferdams which are suitable for embankments and fills. Material for auxiliary and temporary cofferdams shall be material specified or indicated to be placed in spoil areas or materials obtained from Borrow Area D, as indicated on the drawings. All materials placed in auxiliary and temporary cofferdams shall be removed prior to completion of the work.

2-05. OVERTOPPING OF PERMANENT COFFERDAM . - If the water rises and overtops the permanent cofferdam that has been satisfactorily constructed and maintained to the effective elevation shown on the drawings, or specified, resulting in injury to the permanent work within the protected area during the same construction season that diversion is effected, the contractor shall repair all damages so ordered by the Contracting Officer. If the water overtops the embankment after all fill has been satisfactorily placed, the contractor shall repair all damages as directed by the Contracting Officer. Payment of the cost of such repairs will be in accordance with the provisions of Paragraph SC-15 and Paragraph 2-06.

2-06. PAYMENT. - a. The contract lump sum price for Item 2, "Control and Diversion of Water" shall include payment for control, diversion and care of the river during construction; the construction, maintenance and removal of auxiliary and temporary cofferdams, including the rebuilding of auxiliary and permanent cofferdams in case of destruction by flood, except as otherwise provided below. The lump sum contract prices for Item 2 shall also include all costs in connection with the requirements for lowering the water table and dewatering during the initial construction of the dam cut-off as specified in Section 3, "EXCAVATION- OPEN CUT".

b. The contract price shall also include the costs for all pumping drainage and dewatering necessary to obtain and maintain in a dry condition all excavation and work areas, removal of trash and debris, and maintenance of unobstructed flow prior to diversion, and through diversion channels during the remaining period of the contract.

c. Estimates for partial payments for this work will be as follows: Forty-five percent of the contract price when the Middle Branch, Westfield River has been diverted and all cofferdams have been constructed as specified; forty-five percent of the contract price when the entire working area for the dam and dike has been unwatered and the embankments completed to Elevation 596; and ten percent of the contract price when all cofferdams have been disposed of as specified.

d. If, in the opinion of the Contracting Officer, damage to the permanent works under other items of work is caused by the contractor's negligence in the construction and maintenance of the cofferdams, the repairs to the permanent works shall be made by the contractor at no additional expense to the Government.

SECTION 3

EXCAVATION - OPEN CUT
(Items 3, 4, 5, 6, 9, 10, 11, 13 and 14)
(INDEX)

Paragraph No.	Paragraph Title	Page No.
3-01	Scope	3-1
3-02	General Provisions	3-1
	a. Utilization of Materials	3-1
	b. Disposal of Excess and Unsuitable Materials	3-2
	c. Stockpiling	3-2
	d. Shoring and Sheeting, Safety Mesh and Rock Bolting	3-2
	e. Temporary Drains, Pumping, and Unwatering	3-3
	f. Stones in Excavations	3-3
	g. Salvage of Stripping Material for Topsoil	3-3
3-03	Classification	3-4
3-04	Unclassified Excavation, General	3-5
	a. General	3-5
	b. Stripping	3-5
	c. Grading	3-5
	d. Initial Reach for Dam Foundation Cut-Off	3-5
	e. Foundation Drains and Final Reach of Dam Foundation Cut-Off	3-6
	f. Service Bridge	3-7
3-05	Cleaning of Bedrock Surfaces	3-7
	a. General	3-7
	b. Machine Cleaned	3-7
	c. Hand Cleaned	3-7
3-06	Unclassified Excavation, Borrow	3-8
	a. General	3-8
	b. Borrow Area B	3-9
	c. Borrow Areas C and E	3-10

Paragraph No.	Paragraph Title	Page No.
3-07	Rock Excavation	3-10
	a. General	3-10
	b. Final Grades and Excavation Lines	3-11
	c. Blasting	3-11
	d. Benches	3-12
	e. Definition of Lines	3-12
	f. Rock Foundation Preparation	3-13
3-08	Rock Excavation, Borrow	3-14
3-09	Safety Mesh	3-14
3-10	Slides	3-15
3-11	Line Drilling	3-15
	a. Work Included	3-15
	b. Description	3-15
3-12	Measurement	3-15
	a. Unclassified Excavation, General	3-15
	b. Unclassified Excavation, Borrow	3-16
	c. Rock Excavation	3-16
	d. Rock Excavatioh, Borrow	3-16
	e. Safety Mesh	3-16
	f. Line Drilling	3-17
	g. Machine Cleaned Bedrock Surfaces	3-17
	h. Hand Cleaned Bedrock Surfaces	3-17
3-13	Payment	3-17
	a. Unclassified Excavation, General	3-17
	b. Unclassified Excavation, Borrow	3-17
	c. Rock Excavation	3-18
	d. Safety Mesh	3-18
	e. Line Drilling	3-18
	f. Machined and Hand Cleaned Rock Surfaces	3-18

SECTION 3

EXCAVATION - OPEN CUT
(Items 3, 4, 5, 6, 9, 10, 11, 13 and 14)

3-01. SCOPE. - a. The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, and appliances, and of performing all operations in connection with all excavations and cleaning of bedrock surfaces, except as noted below, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract. This section of the specifications does not cover excavations for (1) buildings, (2) utilities, drains, and culvert, and (3) the foundations and removal of auxiliary cofferdams, outside the limits of permanent work. The requirements for these excepted excavations are covered in other sections of these specifications.

b. The term "required excavation" as used in this section is defined as any or all excavations covered in this section other than those in the borrow areas.

3-02. GENERAL PROVISIONS. - a. Utilization of Materials. - All excavated materials shall be satisfactorily disposed of as directed. With the exception of unsuitable materials and materials in excess of those required for the construction of the permanent work, all excavated materials shall be utilized in the permanent work including permanent cofferdams. The only excess material will be stripping material not required for producing topsoil. Only materials unsuitable for use in the construction of embankments and for topsoil shall be used in constructing auxiliary and temporary cofferdams. The Contracting Officer shall be the sole judge as to the suitability of all materials. Materials shall not be spoiled unless specifically authorized. Materials from required excavations and from borrow areas shall be utilized in the permanent work as specified in other sections of these specifications. The contractor shall conduct the work in a manner to utilize all suitable materials from the required excavations except that earth materials from the required excavation for the dam foundation cut-off within the initial limits shown on the drawings which is in excess of that required for the completion of construction of the random section of the dike may be placed in the spoil areas. To insure the greatest possible use of materials from required excavations, all required excavations on the project, except the excavations for the foundation drain of the dike, for the construction of the conduit, and for the dam foundation cut-off within the initial limits shown on the drawings, shall be deferred until materials from these excavations can be used for the construction of embankment and other fills unless the contractor stockpiles suitable fill material at his own expense.

b. Disposal of Excess and Unsuitable Materials. - Excess and unsuitable material from required and borrow excavations shall be spoiled only when specifically authorized. All materials which are authorized to be spoiled shall be disposed of in the spoil areas shown on the drawings and in excavated portions of borrow areas designated herein as spoil areas. Prior to placement of materials, the foundation areas of all spoil areas shall be cleared of all standing timber leaving no stumps higher than 3 feet above the adjacent ground surface and the material thus obtained shall be disposed of as specified in section 1, "PREPARATION OF SITE", for materials obtained from other clearing operations. No separate payment will be made for clearing spoil areas, payment for which will be included in that made for excavation of the materials from their original sources. Spoil materials shall be placed to the lines and grades shown on the drawings or as directed. All spoil areas shall be graded to the final limits shown on the drawings or as directed so as to provide sightly and smooth surfaces sloped for suitable drainage.

c. Stockpiling. - The contractor shall stockpile stripping, topsoil, rock slope protection, and other materials from required and borrow excavations as required for the execution of the work. In addition, the contractor may stockpile materials for his own convenience subject to prior approval. All materials to be stockpiled shall be placed in approved stockpile areas which have been cleared, grubbed, and graded. Stockpiles of random fill material shall be located in approved well drained areas and the surfaces of the stockpiles at all times shall be graded for drainage and rolled so as to be smooth and relatively watertight. Stockpiles of rock slope protection material shall be maintained free of earth and shall be constructed in layers in such a manner as to prevent segregation. Each layer of stockpiled rock slope protection material shall be formed by dumping loads of the materials directly upon the surface of the previous layer. The dumped loads shall be levelled only to the extent necessary to form a base for the next layer. No separate payment will be made for the placement of materials in stockpiles or their excavation therefrom, for the grading of stockpile areas before placement and after removal of the materials. Payment for all work in connection with stockpiling materials under this contract shall be included in the contract unit price per cubic yard for the excavation of the materials from their original sources. Stockpiled material in excess of the quantity used in the permanent work shall be removed and placed in designated spoil areas unless the stockpile area is approved as a spoil area.

d. Shoring and Sheeting, Safety Mesh and Rock Bolting. - The contractor shall be responsible for the unfinished work, and for the safety of workmen from danger of caving, slides and rockfalls unless otherwise specified. Shoring and sheeting may be used at the option of the contractor, except that if considered necessary and the contractor does not use them, their use will be ordered at no additional cost to the Government. Shoring and sheeting shall not be used for excavations which are to be filled or

backfilled with compacted materials unless specifically authorized. Shoring and sheeting shall be erected in a safe and workmanlike manner, in accordance with the requirements of the Corps of Engineers Manual, "General Safety Requirements", and shall be placed in such a way as to afford an ample clearance for ready inspection of permanent work. Sheeting shall be so constructed and carried to such depths as to prevent excessive inflow of water and intrusion of sand and other materials into the area being excavated. Shoring and sheeting shall be removed upon completion of the permanent work as soon as the construction does not require its use. Where shoring and sheeting are used in lieu of excavations to full dimensions of the pay lines, measurement will be taken to the payment lines as shown on the drawings. Safety mesh shall be installed as specified elsewhere in this section of the specifications. Rock bolts shall be installed in the scaled rock faces as specified in Section 5, "ROCK BOLTING". Precautions shall be taken to insure the safety of personnel from hazards of rock falls or rock slides.

e. Temporary Drains, Pumping, and Unwatering. - The contractor shall maintain the sites of work and adjacent grounds in a well-drained condition. Temporary drains and ditches required shall be constructed by the contractor at no additional expense to the Government. The contractor shall provide all necessary equipment and materials and shall unwater and maintain in a dry condition the foundation areas for the various features of work to the extent required by the provisions in this and other sections of the specifications for excavation, preparation of foundation for the dam and dike, grouting, placement of fill, backfill, and all materials in the dam, and dike and other fills and for the construction of concrete structures. Payment for pumping, unwatering, and lowering the ground water table for various features shall be included in applicable payments for excavations of materials unless otherwise designated.

f. Stones in Excavations. - Boulders and stones will be encountered during unclassified excavation. Boulders and stone encountered in required excavations shall be disposed of as directed. Stones and boulders shall be removed from random and impervious fill materials prior to compaction and shall be utilized in rock slope protection as specified in Section 7, "EMBANKMENTS", of these specifications. Stones and boulders removed from material during borrow excavation shall be disposed of within the excavated portions of the borrow area in an approved manner to form sightly piles.

g. Salvage of Stripping Material for Topsoil. - To the extent required, portions of stripping material shall be processed for topsoil in accordance with Section 43, "TOPSOILING, SEEDING, AND MULCHING", of these specifications.

3-03. CLASSIFICATION. - Except as otherwise prescribed, excavations will be classified as follows:

a. Unclassified Excavation. - Unclassified excavation shall comprise the satisfactory removal of all materials including those removed with the aid of drilling and blasting, except the materials removed as rock excavation as defined in subparagraph b below.

b. Rock Excavation. - Rock excavation shall consist of the satisfactory removal of the following:

(1) Boulders or rock blocks detached from bedrock measuring 3 cubic yards or more in volume in overburden materials to be excavated in the rock borrow area and 2 cubic yards or more in volume to be excavated elsewhere.

(2) Bedrock which, as determined by the Contracting Officer, can be removed only by systematic and continuous drilling and blasting. Excavation of bedrock will not be classified as rock excavation where the bedding or fracture system of the bedrock is such that it can be removed in a practicable manner with power equipment such as a shovel or a rooter. Excavation will not be classified as rock excavation as a result of the intermittent drilling and blasting performed by the contractor to increase production.

c. Where material is encountered for which the contractor claims classification as rock excavation for its removal, such material shall be uncovered and exposed and the Contracting Officer notified before proceeding with its excavation. The contractor shall not proceed with the excavation of such material until it has been cross-sectioned and classified by the Contracting Officer. Failure on the part of the contractor to uncover and expose such material, to notify the Contracting Officer, and allow time for cross-sectioning the undisturbed surface of such material will forfeit the contractor's right of claim to any classification other than that allowed by the Contracting Officer for the areas of work in which such materials occur.

d. Stripping. - Stripping shall consist of the removal of surficial materials judged by the Contracting Officer to be unsatisfactory for use as foundation materials or for use in the construction of fills which materials shall include sod, topsoil, stones, swamp deposits, organic materials, artificial fills, road pavements, base courses for pavements, all loose rock on the surface and other materials judged by the Contracting Officer as objectionable. Stripping shall be unclassified excavation except for the removal of boulders or detached rock blocks measuring 2 cubic yards or more in volume which will be rock excavation.

3-04. UNCLASSIFIED EXCAVATION, GENERAL. - a. General. - Unclassified excavation, general, shall consist of the satisfactory removal, hauling to project features, hauling to and placement in stockpiles and spoil areas, of materials removed as unclassified excavation from within the lines, grades, and slopes of all project features as shown on the drawings or as modified in the field by the Contracting Officer, except materials excavated from the borrow areas or as otherwise specified in Section 1, PREPARATION OF SITE. Unclassified excavation, general, shall also include the satisfactory removal and hauling to spoil areas of materials excavated in the rock borrow area to the extent directed. All excess and unsuitable materials as defined in Paragraph 3-02, from the required excavations, shall be disposed of in the spoil areas designated on the drawings or defined in this specification except that spoil material shall be placed to a minimum thickness of 5 feet to form the "spoil blanket" upstream from the dike as shown on the drawings. The sequence of operations, to insure the maximum utilization of materials from required excavation, is specified in Paragraph 3-02, above.

b. Stripping. - Stripping shall be performed within the areas shown on the drawings and shall be limited in depth so as to remove only those surficial materials considered to be unsatisfactory for embankment fill material or unsuitable as a foundation material. Stripping operations shall be performed in such a manner as to salvage materials acceptable for processing for topsoil to the extent required as specified in Section 43, "TOPSOILING, SEEDING AND MULCHING". Only natural surface soil containing humus material shall be stockpiled. The Contracting Officer shall guide and control the extent and final depth of stripping and may direct the contractor to strip to the limits and depths different from those shown on the drawings at no change in the contract unit prices.

c. Grading. - Roads, turnarounds, parking and building areas, and other required areas shall be graded in accordance with the sections indicated on the drawings. Shoulders, ditches, side slope, subgrades, and other designated areas shall be trimmed and dressed in a neat and workmanlike manner to the lines and grades shown on the drawings or stakes in the field. The subgrade upon which road gravel will be placed shall be shaped to a uniformly even and regular grade in accordance with lines and grades indicated on the drawings or as determined in the field.

d. Initial Reach for Dam Foundation Cut-Off. - (1) The initial excavation for the foundation cut-off for the dam shall be done within the limits shown on the drawings. The bottom grades as shown on the drawings, or as modified by the Contracting Officer prior to the start of the excavation, shall be used to establish the location of the side slopes. If it is determined during the course of the excavation operations that the excavation must extend below the grades indicated to effect the desired cut-off or to reach the bedrock surface, the excavation slopes below the indicated grades shall be constructed as directed.

(2) The excavation shall be made in the dry. The contractor shall install and maintain an adequate system of wells, well points, or other similar devices and shall lower and maintain the water table in the area of the excavation so that the excavation, grouting, foundation preparation, and placement of fill will be entirely in the dry. Pumping from open areas and sumps within the area of excavation will not be permitted except for the removal of water from depressed rock areas at the final bottom of the excavation. The contractor shall be responsible for producing and maintaining stable earth excavation slopes.

(3) Thirty (30) days prior to the start of the initial excavation, the contractor shall submit plans and data relative to his proposed system or systems and methods so that all work including excavation will be in the dry, and to any proposed construction in the bottom of the excavation to aid in dewatering the foundation surface and shall obtain written approval from the Contracting Officer prior to proceeding with the work. Approval of the dewatering system by the Contracting Officer will not relieve the contractor of responsibility for the adequacy of the system or producing and maintaining the conditions required by this specification nor shall approval be construed as obligating the Government for any damage except as provided for in paragraph in SPECIAL CONDITIONS entitled "Damage to Work".

(4) The entire excavation, grouting, and foundation preparation within the limits of initial work and the placement of compacted impervious fill up to five feet above the elevation of the adjoining stripped ground surface in the river area shall be accomplished prior to the construction of the upstream permanent cofferdam. The responsibility of the contractor relative to flooding shall be as stated in SPECIAL CONDITIONS.

e. Foundation Drains and Final Reach of Dam Foundation Cut-Off. - This subparagraph applies to the excavations for the embankment foundation drains and the reach of the dam foundation cut-off beyond the initial reach as shown on the drawings. The grades of the bottoms of the foundation drains and cut-off as shown on the drawings shall be used to establish the locations of the side slopes for the excavation except as stated herein. The downstream excavation slope between Stations 8 plus 50 and 9 plus 25 for the dam foundation drain and both the upstream and downstream excavation side slopes for the dam foundation cut-off east of the initial excavation limits shall be modified in the field according to the actual elevation of the bedrock surfaces to provide the widths of the bottoms as shown on the drawings. The excavations shall be continuously dewatered during excavation operations, preparation of foundation and the placement of fill materials except that a maximum of 1-foot depth of water will be permitted in the bottom of the excavation for the foundation drains during the placement of the initial layers of fill material. The contractor shall be responsible for producing stable side slopes for all excavations and shall

provide such means as may be necessary to maintain their stability. The excavations for the dam shall not be accomplished until the excavated materials can be placed directly into the random fill section of the dam.

f. Service Bridge. - The excavation for the service bridge abutment shall not be made until after the compacted impervious fill of the dam at the location of the abutment has been constructed to an elevation of 3 feet above the bottom of the required excavation. Excavation for the construction of Pier No. 1 shall not be started until the dam embankment has been completed to Elev. 593.

3-05. CLEANING OF BEDROCK SURFACES. - a. General. - The preparation of rock surfaces against which concrete is to be placed is specified elsewhere in this section of the specifications. The excavation at and cleaning of other bedrock surfaces shall be in accordance with the provisions in the following subparagraph. Areas other than those designated shall be cleaned, if directed. All excavation required for the cleaning and preparation of the surfaces shall be paid for at the applicable contract unit prices for "Unclassified Excavation, General", and "Rock Excavation - General". In addition, payment for cleaning shall be made as stated elsewhere in this section.

b. Machine Cleaned. - The following bedrock surfaces shall be "machine cleaned":

(1) Surfaces of bedrock below which the rock is to be excavated for rock slope protection material including rock borrow area.

(2) Surfaces of bedrock within the designated limits of "machine cleaned" areas of the foundation of the embankments as shown on the drawings.

Machine cleaning shall consist of the removal of all earth and loose rock and rock fragments from the entire bedrock surface including areas of depressions, large crevices, and large open joints. The material need not be removed in areas where the horizontal width of the openings are less than 16 inches. The degree of cleaning shall at least be equivalent to that obtainable with a toothless one-quarter yard backhoe dipper after the material has been loosened by prior operations. No rock excavation will be required to remove overhangs or similar obstacles to the cleaning operation.

c. Hand Cleaned. - The following bedrock surfaces shall be "hand cleaned":

(1) Surfaces of areas within the embankment foundation areas as indicated by the drawings.

(2) All surfaces within the limits of an embankment foundation area to be stripped or excavated to bedrock as shown on the drawings except areas designated to be "machine cleaned".

(3) All surfaces exposed by stripping operations between dam foundation cut-off and the upstream limit of the previous zone.

(4) All surfaces within the limits of an embankment foundation produced by rock excavations for concrete structures except areas to be covered with concrete.

Hand cleaning of bedrock surfaces and rock surfaces produced by rock excavations shall consist of the removal of all earth, disintegrated bedrock, semi-detached or detached rock blocks, and rock fragments from the entire bedrock surface including areas of depressions, crevices and joints. The bedrock surface shall be cleaned by washing or sweeping. In addition, all cracks, joints and crevices in the bedrock surfaces shall be cleaned by use of jets of air or water or a combination thereof to the satisfaction of the Contracting Officer immediately prior to the placement of compacted gravel or backfill thereon or in the preparation for the filling of these openings with mortar in areas to be covered with compacted impervious fill as specified in Section 7, "EMBANKMENTS". Hand cleaning in the areas against which impervious materials are to be placed shall be accomplished after the special rock excavation at the surface required to reduce the quantity of hand compacted fill and to eliminate overhangs as specified elsewhere in this section of the specification. Rock excavation will not be required at surfaces of rock upon or against which gravel fill or gravel backfill is to be placed. Initial hand cleaning of rock surfaces produced by rock excavation for concrete structures and to the extent practical, the filling of the cracks with mortar as specified in Section 7, "EMBANKMENTS", shall be accomplished at the same time as the preparation of rock surfaces against which concrete is to be placed.

3-06. UNCLASSIFIED EXCAVATION, BORROW. - a. General. - Unclassified excavation, borrow, shall comprise the satisfactory removal, hauling to the project features, hauling to and placement in stockpiles and spoil areas of materials excavated from the borrow areas and removed as unclassified excavation defined in Paragraph 3-03 of these specifications. Materials shall be excavated from the designated borrow areas to the extent required to obtain suitable impervious fill, pervious fill and gravel bedding materials. The Contracting Officer shall guide and control the stripping, removal of unsatisfactory surface materials, and the selection of materials in the borrow areas to obtain materials with the specified requirements. The contractor shall excavate pits with a backhoe or bulldozer in Borrow Areas C and E as directed by the Contracting Officer to obtain information required for the proper control of the excavation to obtain the desired materials. It is expected that approximately 50 pits will be required. Boulders and oversize stones removed during the

excavation shall be disposed of in the spoil areas. All clearing operations shall be as specified in Section 1, "PREPARATION OF SITE", for clearing operations at other locations.

b. Borrow Area B. - (1) Impervious fill material for all embankments and fills shall be obtained from Borrow Area B. This borrow area shall be cleared within limits of 25 feet beyond the limits of the excavation. Clearing for stockpiles and spoil piles outside the designated limits of excavation shall be confined to the actual areas required. The borrow area shall be stripped only within the area of the limits of actual excavation. Stripping shall be extended only to the depth required to remove sod, forest debris, humus material, and material containing small roots, all as directed. The depth of stripping shall not be extended in order to remove occasional or large roots which can be removed during placement of the impervious fill material. The required quantity of approved stripping material containing humus and organic material shall be salvaged and stockpiled as specified in Section 43, "TOPSOILING, SEEDING, AND MULCHING", for use in Borrow Area B, or other project areas to be topsoiled. The portion of excavation slopes existing each fall shall be graded, dressed, topsoiled and seeded.

(2) The impervious fill material shall be excavated in nearly horizontal lifts extending over the entire area to be excavated, as indicated by the upper limit of slope lines as shown on the drawings. Unless otherwise directed, the final excavation slope lines shall be 1 (vertical) on 3 (horizontal) extending downward from the limits shown on the drawings except as specified in subparagraph (4) below. The finished bottom of the excavation shall be uniformly graded to the satisfaction of the Contracting Officer. It shall be approximately horizontal with grades to provide drainage of not steeper than 10 percent. No excavation shall be made beyond the designated final excavation slope lines of 1 on 3. The final excavation slopes shall be trimmed and graded with a bulldozer or similar equipment to provide finished slopes composed entirely of undisturbed natural soil. Filling on the slopes shall be limited to that required to fill erosion areas immediately prior to the placement of topsoil.

(3) Prior to the start of borrow excavations, the contractor shall construct ditches and embankments along the limits of excavation which will prevent surface water from entering into the area of excavation. Additional drainage facilities shall be constructed in the excavation area to channel subsurface and rain water from areas of excavation operations. The final bottom of the excavation areas shall be graded for proper drainage. All operations in connection with drainage including the filling of temporary ditches shall be subject to the approval of the Contracting Officer and, if not considered adequate by the Contracting Officer, additional facilities shall be provided. Permanent interceptor drainage ditches shall be constructed along the top of slopes at locations shown on the drawings and at other locations if

directed. The depths, excavation slopes and exact location of the permanent ditches shall be as directed in the field. Materials from these ditches shall be spoiled between the ditch and the excavation areas unless otherwise directed.

(4) It is expected that bedrock will be encountered in some areas within the designated slopes. In areas where bedrock becomes exposed, the excavation areas shall be extended to the extent practical so that the rock surfaces shall form the excavation limits. All bedrock surfaces exposed shall be cleaned to the extent feasible with bulldozers.

c. Borrow Areas C and E. - (1) Pervious fill and gravel bedding materials shall be obtained from Borrow Area C and if required also from Borrow Area E. The entire area of Borrow Area C shall be cleared. If the contractor elects, the entire area of Borrow Area E may be cleared. In both of these areas, the required materials are covered with a surface deposit of silty sand or sandy silt underlying the topsoil. The thickness of the unsuitable soil and stripping material varies from 1 to 5 feet but probably averages 3 feet for both Borrow Areas. The areal extent to which these unsuitable materials shall be removed shall be limited to that required to obtain the required quantities of suitable materials. The initial removal of unsuitable surficialmaterial shall be limited to 2/3 the area of Borrow Area C. Removal of the unsuitable surficial material from additional portions of Borrow Area C and Borrow Area E shall be accomplished only upon written approval of the Contracting Officer. Care shall be taken in removing the unsuitable surficial materials so as to conserve the underlying sands and sandy gravels. Topsoiling and seeding of the excavated areas or final grading in these borrow areas will not be required. The Contracting Officer reserves the right to revise the limits of Borrow Area C in the field without affecting the contract unit price.

(2) The excavation in Borrow Areas C and E shall be to the full depths of suitable materials except that excavation shall not be required below the level of the bottom of the river adjacent to, or opposite, the portion of the area being excavated. The contractor shall excavate the materials on a face for the full depth of required excavation in a manner that shall mix the materials at all horizons.

3-07. ROCK EXCAVATION. - a. General. - The contractor shall excavate all rock at the locations of the dam, spillway, water supply outlet works, and approaches for flood control outlet works as required for the permanent works to the slopes, lines and grades shown on the drawings or otherwise directed. Excavation to lines and grades other than those shown on the drawings will be directed in writing. Rock excavation shall include continuous maintenance and scaling of the side slopes. In areas of rock excavation, the rock surface shall be maintained in a cleaned condition after overburden excavation and prior to rock excavation, to prevent contamination of the excavated rock with overburden materials. The placement

of concrete structures shall be to the elevations or lines indicated on the drawings, except as otherwise noted. In the event that excavations for any structure should reveal that rock or other material encountered at design grades would provide unsatisfactory foundation, the excavation limits in that area shall be adjusted as necessary to provide an acceptable foundation. Additional excavation and concrete quantities required by such adjustment will be paid for at the existing contract prices for these items. Weathered seams and joints in rock at structure foundations shall be cleaned to sound rock or to contact of the sides or to a depth of not less than 3 feet and the joint or seam then backfilled with concrete prior to placing concrete for the structure.

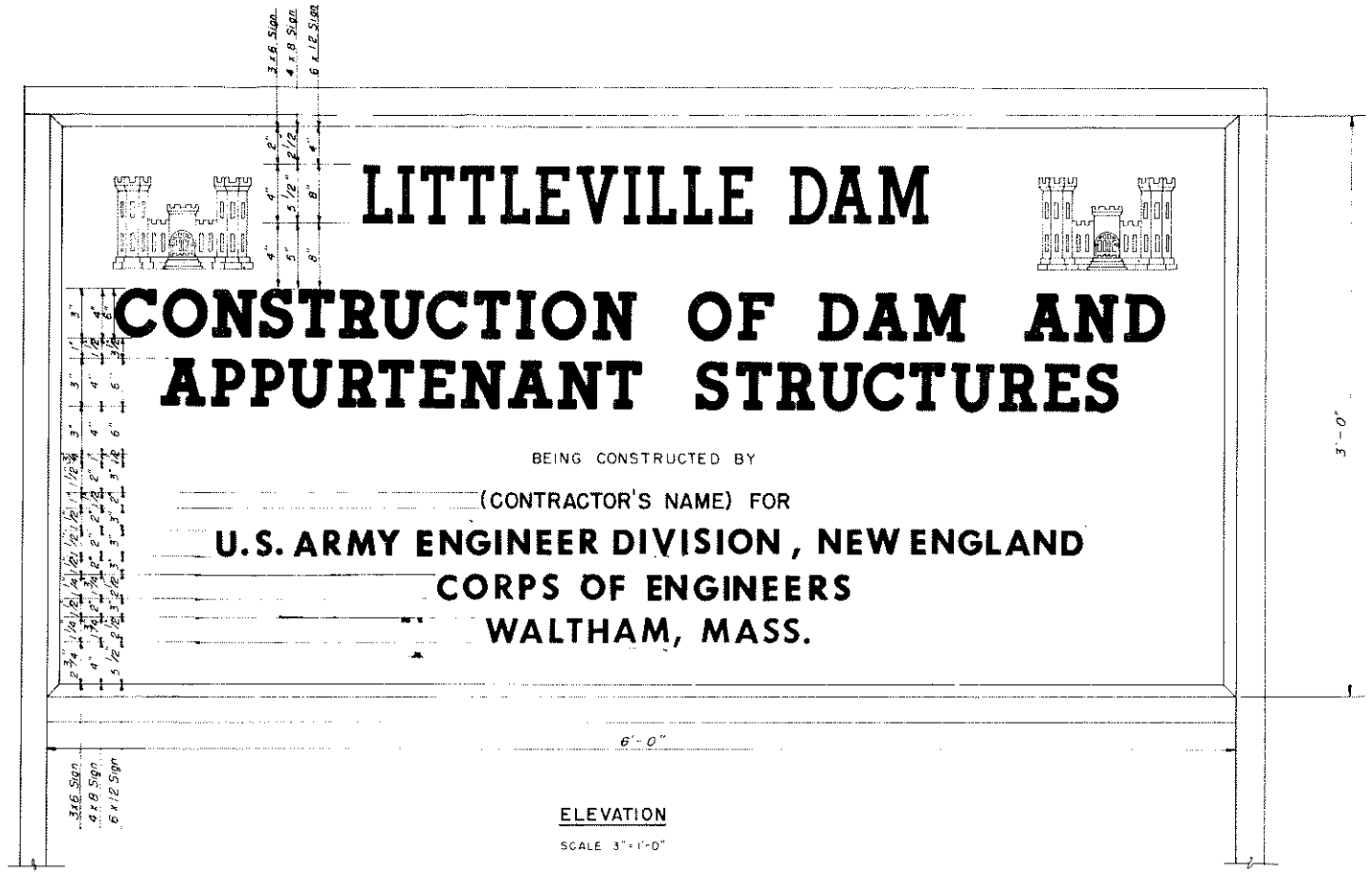
b. Final Grades and Excavation Lines. - The inherent structural characteristics of the bedrock will require that excavations be carefully made in approach to the grades and lines shown on the drawings. From observations of the breaking characteristics of the rock gained at the outset of the work and as the excavation progresses, the charges used in blasting and the loading and spacing of drilled holes will be revised to prevent overbreak and shattering of rock outside the design slopes or grades. The blasting shall be performed only to the depth, amount, and extent with explosives of such quality and power as will break the rock to the lines and grades shown on the drawings and yet will not fracture the rock, open incipient fractures, enlarge existing fractures, make the excavation unduly large or irregular, or cause other damage outside the prescribed limits of excavation. No hole for blasting shall be drilled more than two-thirds the depth of proposed excavations over 15 feet. Blasting shall be performed in a manner most practicable, so as to obtain maximum production of fragmentation suitable for placement in rock fills. As excavations approach final lines and grades the depth of holes for blasting and the amount of explosives shall be reduced progressively. Whenever, in the opinion of the Contracting Officer, blasting to grade or lines may damage the rock against which concrete is to be placed, excavation within 1 foot of lines and grades shall be done by drilling, chipping, picking, barring, wedging or similar methods in which explosives are not used and which will leave the foundation bed or side walls in a solid and unshattered condition. Where major incipient or open planes of cleavage or jointing are encountered which approximate and are behind the design slip and present a potential slope or slide condition not amenable to bolting, excavation shall be made to these planes as directed by the Contracting Officer at applicable unit prices. The contract price for rock excavation shall include scaling of the side slopes. The sides of all rock cuts will be carefully scaled of all loose and projecting rock as excavation progresses. Rescaling will be required at no additional cost to the Government as often as may be necessary to permit thorough inspection of the rock surface or whenever rock remaining in the side slopes loosens to the extent that it becomes a potential safety hazard.

c. Blasting. - Any damage by blasting done to the work or to properties beyond the limits of the work shall be repaired or otherwise

satisfactorily cared for by the contractor at his expense. The contractor or his surety shall make investigations or prior inspection of structures near the areas of blasting and shall provide such vibration monitoring during the blasting operations as may be necessary to assure conformance with regulatory statutes or directives established by state or other authorities to limit the amount of vibrations generated by blasting. Such investigations shall be conducted by a qualified vibration engineer and copies of the results of investigations including seismograph records shall be furnished the Contracting Officer. The contractor will be required to submit a plan of operations showing the proposed size, spacing, depths and loading of all holes and to obtain the approval of the Contracting Officer before such work is started. When, in the opinion of the Contracting Officer, damage is being done to the rock outside the prescribed limits of excavation, the contractor will be required to revise his drilling and blasting procedure to obtain sound slopes and grade lines and such revisions, if necessary, shall include the drilling of closely spaced holes at no additional cost to the Government. Particular care will be exercised in excavations for the water supply outlet works, in approaches to and for portals of the flood control tunnel, and in excavations for bridge seats and slopes below. Blasting within 100 feet of concrete which has been in place less than seven (7) days will not be permitted under any circumstances, and blasting in the vicinity of concrete older than seven (7) days will be permitted only if approved by the Contracting Officer. Approval of the methods of blasting or the strength and amount of explosives used will not relieve the contractor of his responsibility in connection with damages resulting from blasting operations. All operations involving the transportation, storage, and use of explosives shall be conducted in accordance with applicable laws and the Corps of Engineers handbook "General Safety Requirements" and as specified in Part II, SPECIAL CONDITIONS. The contractor shall provide and keep on the project at all times a radio frequency ammeter or in lieu thereof, a pilot lamp which lights up brightly at 0.06 ampere as recommended in the Institute of Makers of Explosives Pamphlet No. 20 dated 1956, entitled, "Radio Frequency Energy a Potential Hazard in the Use and Transportation of Electric Blasting Caps". Tests shall be made before loading every round. The contractor shall be liable for all injuries or deaths of persons and all property damage caused by blasting or explosives.

d. Benches. - Whenever a bench or other horizontal surface superimposes a vertical or sloped face, the excavation of the horizontal surface shall be completed before the vertical or sloped surface is begun in order to prevent loss of or damage to the vertical or sloped face. Blasting for the bench excavation shall be carefully controlled to prevent damage to that rock which will subsequently form the vertical or sloped face.

e. Definition of Lines. - (1) Rock excavation on which concrete structures are to be placed shall be to the following lines. The "A" line

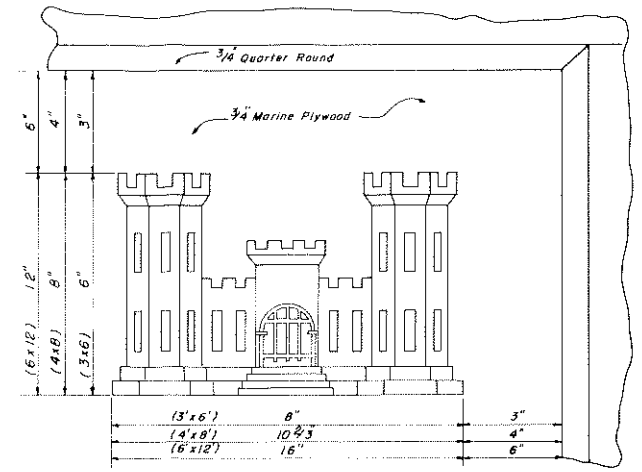


ELEVATION

SCALE 3" = 1'-0"

NOTE:

This elevation is of a 3' x 6' sign See specifications for size required under this contract

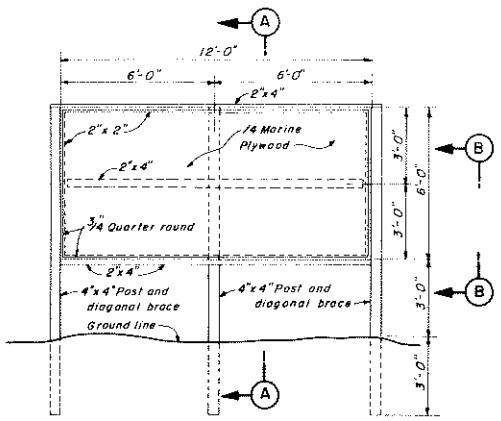


DETAIL OF CASTLE

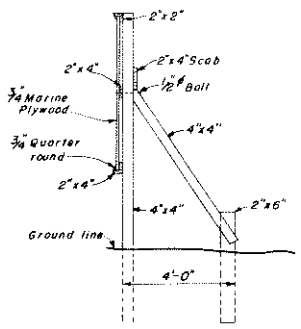
SCALE 6" = 1'-0"

SPECIFICATIONS

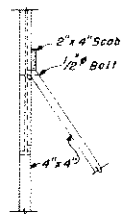
1. Posts, rails and bracing shall be No.1 yellow pine or approved equal SAS-Fed. Spec. MM-L-751c.
2. All exposed surfaces shall be given one coat of linseed oil and wiped prior to primer coat.
3. All exposed surfaces shall be given one coat of exterior lead and oil primer-Fed. Spec. TT-P-25a and two finish coats of white exterior oil paint-Fed. Spec. TT-P-104.
4. Black lettering and red Engineer Castles shall be Kem Bulletin Colors C20 B1 and C20 R7 respectively as manufactured by Sherwin-Williams Co. or approved equal.
5. Marine Plywood shall conform to Commercial Standard CS-45, exterior type, Grade A-C.



ELEVATION

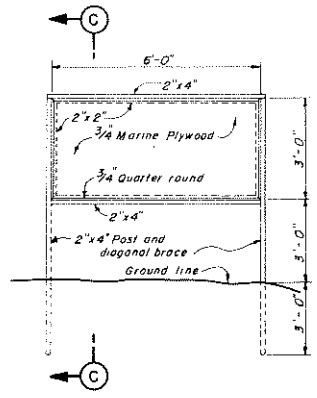


SECTION A-A

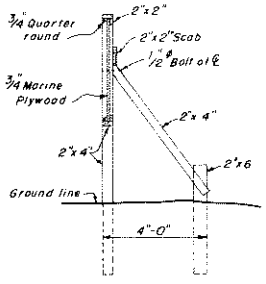


SECTION B-B

6' x 12' SIGN



ELEVATION



SECTION C-C

3'x6' SIGN
AND
4' x 8' SIGN

CONSTRUCTION SIGNS

SCALE 3/8" = 1'-0"

CONSTRUCTION SIGN

DRAWING NUMBER

CT-1-5818

Connecticut River Flood Control Project - Westfield River Littleville Dam - Volume 2 1962



1962 Reports

Specifications for construction of Dam and appurtenant structures. Middle Branch of Westfield River.

City/Town	Westfield
Dam	Littleville Dam
Name	U S Army Engineers
Name	Massachusetts Comm
Water	Connecticut River
Water	Westfield River

Serial No. CIVENG-19-016-62-49

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR

CONSTRUCTION

OF

LITTLEVILLE DAM

AND

APPURTENANT STRUCTURES

MIDDLE BRANCH, WESTFIELD RIVER

MASSACHUSETTS

VOLUME II OF III

Technical Provisions
(Sections 15 - 31)

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

TABLE OF CONTENTS

VOLUME I OF III

INVITATION FOR BIDS

BID FORM

PART I - GENERAL CONDITIONS

PART II - SPECIAL CONDITIONS

PART III - TECHNICAL PROVISIONS

Section No.	Title
1	PREPARATION OF SITE
2	CONTROL OF DIVERSION OF WATER
3	EXCAVATION - OPEN CUT
4	EXCAVATION - TUNNEL AND SHAFT - ITEMS 7 & 8
5	ROCK BOLTING
6	TUNNEL RIB SUPPORTS
7	EMBANKMENTS
8	ROCK SLOPE PROTECTION, SELECTED RIPRAP AND GRAVEL BEDDING
9	MISCELLANEOUS FILLS, ROADS, DRIVES, AND PARKING AREAS
10	CULVERT
11	FOUNDATION DRILLING AND GROUTING
12	TUNNEL GROUTING
13	ANCHOR BARS
14	CONCRETE

VOLUME II OF III

15	48-INCH WATER SUPPLY PIPE
16	WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
17	FLOAT WELL AND AIR VENT
18	SLUICE GATES, VALVES AND ACCESSORIES
19	OMITTED
20	OMITTED
21	OMITTED
22	TRAVELING CRANES
23	DIESEL ENGINE-GENERATOR SET
24	VENTILATING SYSTEM, MECHANICAL
25	ELECTRICAL WORK; INTERIOR
26	HEATING SYSTEMS, FORCED-WARM-AIR: OIL-FIRED FURNACE
27	ELECTRICAL-EXTERIOR
28	STRUCTURAL STEEL BRIDGES
29	MISCELLANEOUS METAL ITEMS
30	METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES
31	METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

VOLUME III OF III

Section No.	Title
32	TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS
33	MISCELLANEOUS ITEMS OF WORK
34	UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
35	PLUMBING, GENERAL-PURPOSE
36	HEATING SYSTEM; FORCED-HOT-WATER, OIL-FIRED
37	WATER SUPPLY WELLS
38	WATER AND SEWER SYSTEMS
39	OMITTED
40	PAINTING
41	BITUMINOUS CONCRETE PAVEMENT
42	BITUMINOUS SURFACE TREATMENT
43	TOPSOILING, SEEDING AND MULCHING

SECTION 15

48-INCH WATER SUPPLY PIPE
(Item 65)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
15-01	Scope	15-1
15-02	Applicable Publications	15-1
	a. Federal Specification	15-1
	b. American Society for Testing Materials Standards	15-1
	c. Corps of Engineers	15-1
	d. American Water Works Association	15-1
	e. American Standards Association Standard	15-1
15-03	General	15-1
	a. Strength Requirements	15-2
	b. Responsibility and Certification	15-2
15-04	Materials	15-2
	a. Concrete	15-2
	b. Reinforcement	15-2
	c. Rubber Gasket	15-3
15-05	Installation	15-3
	a. General	15-3
	b. Jointing	15-3
	c. Concrete	15-3
15-06	Anchors	15-3
15-07	Cast Iron Pipe and Fittings	15-3
15-08	Tests	15-4
15-09	Payment	15-4

SECTION 15

48-INCH WATER SUPPLY PIPE
(Item 65)

15-01. SCOPE. - This section covers construction of the 48-inch water supply pipe, complete, including pipe supports and appurtenances.

15-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

a. Federal Specifications.

SS-C-192d Cement, Portland.

b. American Society for Testing Materials Standards.

C-231-56T Air Content of Freshly Mixed Concrete by the Pressure Method.

C-33-59 Concrete Aggregates.

c. Corps of Engineers.

CRE-C13-55 Evaluation of Air-Entraining Admixtures for Concrete.

d. American Water Works Association.

C-100-52 Cast Iron Pressure Fittings.
C-301-58 Reinforced Concrete Water Pipe, Steel Cylinder Type, Prestressed.

e. American Standards Association Standard.

A21.2-1953 Cast Iron Pit Cast Pipe for Water or Other Liquids.

15-03. GENERAL. - Concrete pipe shall conform to the applicable requirements of AWWA C301-58, except as modfied hereinafter. The pipe joint shall be sealed by a rubber gasket. Each length of pipe shall be provided with bell and spigot ends formed by steel joint rings securely welded to the cylinder. The spigot ring shall be lined with concrete on its exterior surface. Portions of the joint rings which will be exposed after the pipe is manufactured shall be protected from corrosion by a metallic coating or equivalent.

49

applied by an approved method. The spigot ring shall have a groove for the purpose of receiving, holding and protecting the gasket. The steel for bell rings shall be 1/4 inch or more in thickness and shall conform to Grade A or B, ASTM Specification A-283. The steel for the spigot ends shall conform to Grade A, ASTM Specification A-31. The joint shall conform in all essential details with the rubber and steel joint for concrete pressure pipe as manufactured by Lock Joint Pipe Company under their Specification SP5-56.

a. Strength Requirements. - Pipe shall be designed to withstand an internal pressure of not less than 135 pounds per square inch. Two lengths of pipe selected at random, shall be tested to show the pipe will withstand the design internal pressure.

b. Responsibility and Certification. - All tests performed on the pipe shall be observed by a representative of the Contracting Officer. The Government reserves the right to observe and inspect all phases of the manufacture and testing of the pipe. The contractor shall be responsible for having the materials, concrete and pipe he proposes to furnish tested to demonstrate conformance to the applicable specifications. Certified copies of the test reports shall be delivered to the Contracting Officer before the pipe is installed.

15-04. MATERIALS. - The following materials shall conform to the respective specifications and the requirements specified below:

a. Concrete. - Concrete shall be composed of portland cement, fine and coarse aggregate, water and an air-entraining admixture.

(1) Portland Cement shall conform to Federal Specification SS-C-192d, Type II.

(2) Processed Aggregates. - Aggregates shall conform to ASTM Standard C33 except the grading requirements shall not apply.

(3) Air-Entraining Admixture. - The air-entraining admixture shall be any approved substance or compound which will produce entrained air in the concrete. The air-entraining admixture shall conform to Corps of Engineers Serial No. CRD-C13 and will be accepted on manufacturer's certification of compliance. The air content by volume shall be 5.0 percent plus or minus 1.0 percent as determined by ASTM Standard C231.

(4) Water. - Water used in mixing and curing concrete shall be fresh, clean and suitable for use as drinking water.

b. Reinforcement. - Reinforcement steel shall be in accordance with AWWA Specification C301-58.

c. Rubber Gasket. - The gasket sealing the joint shall be made of rubber of special composition, having a texture to assure a water-tight and permanent seal and shall be the product of a manufacturer having at least five years experience in the manufacture of rubber gaskets for pipe joints. The gasket shall be a continuous ring, of suitable cross section and of such size as to fill the groove on the spigot joint ring when the pipes are laid. The rubber gasket shall be the sole element depended upon to make the joint watertight and shall have smooth surfaces free from pitting, blisters, porosity and other imperfections.

15-05. INSTALLATION. - a. General. - The concrete pipe shall be supported on chairs or other suitable means to substantially and uniformly support the pipe to the correct line and grade as recommended by the pipe manufacturer. The supports shall be adequate to hold the pipe at the correct line and grade during placement of concrete specified in subparagraph c. below. The pipe shall be anchored to prevent movement during placement of concrete. All pipe laying shall proceed from the intake with the tongue ends of tongue-and-groove pipe pointing upstream. Each pipe shall be laid true to line and grade and in such manner as to form a close joint with the adjoining pipe. As the work progresses, the interior of the pipe shall be cleared of all dirt and superfluous materials of every description.

b. Jointing. - The pipe shall be jointed in accordance with the manufacturer's recommendations. In making the joints on the interior of the pipe, special care shall be taken to assure a smooth surface with no projections or depressions.

c. Concrete. - After pipe has been inspected and approved by the Contracting Officer, concrete shall be placed and compacted around the pipe as specified under Section 14, CONCRETE.

15-06. ANCHORS. - Anchors shall be provided at the quarter points of each length of pipe in accordance with the details shown on the drawing. Bolts, washers and strap shall be bronze. Material shall conform to applicable requirements of Sections 30 and 31.

15-07. CAST IRON PIPE AND FITTINGS. - The cast iron pipe, tee, wall sleeve, bulkheads and adaptors shall conform to the applicable sections of AWWA Specification C-100. Bulkheads shall be provided at each end of the pipe for testing but the upstream one shall remain permanently. Flanges shall be 125 pound American Standard. Adaptors pipe and tee shall be Class C. The wall sleeve shall be Class D. After assembly the bolts shall be completely coated with a bitumastic paint. All cast iron pipe and fittings shall be suitably supported on concrete blocks.

15-08. TESTS. - Upon completion of the water line and before the diversion conduit is completed. The entire water line shall be tested under a hydrostatic head of 160 feet under the supervision of the City of Springfield Water Department. The contractor shall make all necessary arrangements with the Water Department when the water line is ready for testing and shall inform the Contracting Officer of all arrangements made. The contractor shall provide a downstream bulkhead and the necessary bracing to withstand the static thrust. In addition the contractor shall be required to furnish any temporary blocking on the sides and/or top of the pipe to resist any movement which might otherwise occur. River water is acceptable for testing purposes. The pipe shall be pressurized and held at the maximum pressure for three hours after the contractor has repaired all leaks.

15-09. PAYMENT. - Payment for all work specified in this section, except for concrete placed around the pipe, will be made at the contract lump sum price for Item No. 65, "48-Inch Water Supply Pipe". Concrete placed around pipe will be measured and paid for under Item No. 56.

SECTION 16

WATER SUPPLY INTAKE TOWER AND
FLOCD CONTROL GATE SHAFT - MISCELLANEOUS
(Items 68 and 69)

Paragraph No.	Paragraph Title	Page No.
16-01	Scope	16-1
16-02	Drawings for Approval	16-1
16-03	Concrete	16-1
16-04	Miscellaneous Metals	16-1
16-05	Flue Linings and Thimbles	16-1
	a. Materials	16-1
	b. Installations	16-1
16-06	Masonry Work	16-2
	a. Materials	16-2
	b. Handling and Storage	16-3
	c. Samples	16-3
	d. Certificates	16-3
	e. Tests for Drying Shrinkage	16-3
	f. Test for Air-Dry Condition	16-4
	g. Test for Mortar	16-4
	h. Erection	16-4
	i. Pointing and Cleaning	16-6
16-07	Roofing	16-6
	a. General	16-6
	b. Materials	16-6
	c. Application of Roofing	16-7
16-08	Calking	16-8
	a. Materials	16-8
	b. Application	16-8
16-09	Aluminum Windows	16-8
	a. Samples	16-8
	b. General Requirements	16-9
	c. Windows	16-9
	d. Insect Screens	16-10

Paragraph No.	Paragraph Title	Page No.
	e. Glass	16-11
	f. Glazing	16-11
	g. Installation	16-11
	h. Protection	16-11
	i. Cleaning	16-12
16-10	Aluminum Letters	16-12
	a. General	16-12
	b. Castings	16-12
	c. Lettering	16-12
16-11	Flashing	16-12
	a. Copper Flashing	16-12
	b. Soldering	16-12
	c. Seams	16-12
	d. Expansion Joints	16-13
	e. Cap Flashings	16-13
	f. Reglets	16-13
16-12	Exterior Hollow Metal Doors	16-13
	a. General	16-13
	b. Material	16-13
	c. Painting	16-14
	d. Hardware	16-14
	e. Frames	16-14
16-13	Interior Hollow Metal Doors	16-15
	a. Materials	16-15
	b. Doors	16-15
	c. Hardware, (Per set swing door)	16-15
	d. Filter Chamber Access Door	16-15
	e. Air-Tight Swing Doors	16-15
16-14	Carpentry	16-15
	a. Kitchen Cabinets	16-15
	b. Shelving	16-15
	c. Framing	16-16
	d. Finish	16-16
	e. Plywood Doors	16-16
	f. Folding Door	16-16
16-15	Government-Furnished Items - Gate Shaft Structures	16-16

Paragraph No.	Paragraph Title	Page No.
16-16	Fire Extinguisher	16-16
16-17	Louvers	16-16
	a. Fixed Louvers	16-16
	b. Screens	16-17
	c. Motorized Louvers	16-17
	d. Damper Motor	16-17
	e. Ductwork	16-17
	f. Filter	16-17
16-18	Scuppers	16-17
16-19	Cant Strips	16-18
16-20	Bronze Plaques	16-18
16-21	Roof Hatchways	16-18
16-22	Bronze Plugs	16-18
16-23	Payment	16-18
	a. Payment	16-18
	b. Other Items	16-18

SECTION 16

WATER SUPPLY INTAKE TOWER AND
FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
(Items 68 and 69)

16-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all labor, plant, equipment, materials and appliances, and performing all operations in connection with the construction of the intake tower and gate shaft superstructures and necessary appurtenances thereto, except furnishing and installing of equipment and accessories specifically included under other payment items, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

16-02. DRAWINGS FOR APPROVAL. - Before fabricating or furnishing any of the items listed below and all other shop fabricated metal items, detail shop drawings supplemented with descriptive data shall be submitted for approval. Samples shall be submitted if specified elsewhere in this section.

(1) Windows.

(2) Metal doors and frames - showing details of shop work, assembly moulding, and hardware.

(3) Scupper lining and reglets.

(4) Aluminum letters.

16-03. CONCRETE. - All concrete work shall be in accordance with Section 14, CONCRETE. In addition, the thresholds (concrete sills) shall contain abrasive aggregate of aluminum oxide or emery graded from particles retained on a No. 50 sieve to particles passing a No. 8 sieve, using 1/4 pound of abrasive aggregate for each square foot of surface.

16-04. MISCELLANEOUS METALS. - All structural steel, miscellaneous metals and workmanship shall be in accordance with Sections 29, 30, and 31 of these specifications. Shop drawings shall be submitted for all shop fabricated metal items.

16-05. FLUE LININGS AND THIMBLES. - a. Materials. - Flue linings shall be terra cotta free from blisters and warping, standard sizes, and of sound manufacture. Thimbles shall be provided as directed by the Contracting Officer.

b. Installation. - Chimneys shall be built of concrete, lined with terra cotta flue lining of the size shown on the drawings, and

extending from one foot below the smoke inlet, the full height of the flue and a distance of not less than two inches above the chimney. A suitable cast-iron cleancut door and frame and thimble shall be placed for each chimney. Mortar for joints of flue lining shall be made with refractory cement low temperature grade, and struck smooth inside. Linings shall be built in as the work progresses.

16-06. MASONRY WORK. - Concrete blocks shall be installed where indicated.

a. Materials. - (1) Aggregate used in making concrete masonry units shall conform to ASTM Standard C33-59 or C331-59T except as modified hereinafter. Grading of aggregates as stipulated in Section 7 in ASTM Standard C33-59 and testing of lightweight aggregates for drying shrinkage as stipulated in Section 6(a) in ASTM Standard C331-59T will not be required. Lightweight aggregates shall comply with the following requirements when tested for stain-producing iron compounds.

(a) When determined by visual classification method, the iron stain deposited on the filter paper shall not exceed the "light-stain" classification.

(b) When determined by chemical analysis method and reported Fe_2O_3, the iron stain deposited on the filter paper from a 200 gram sample shall not exceed 1.2 mg. Fe_2O_3.

(2) Anchors and Ties. - Anchors and ties shall be of approved design and shall be zinc-coated ferrous metal of the types indicated on the drawings or approved. Zinc coating of anchors and ties shall conform to ASTM Standard A 153-60, Class B-1, B-2, or B-3, as required. Anchors for dovetail slots shall be 1-inch flat anchors not less than 0.0598-inch in thickness.

(3) Cement shall conform to Federal Specification SS-C-192d.

(4) Concrete masonry units shall be of modular dimensions and shall include all closers, jamb units, and special shapes and sizes required to complete the work as indicated. Units shall be of the same appearance and shall be cured by the same process. Units shall be sound and free from cracks, chipped edges, or other defects that would interfere with their proper setting or impair the strength, appearance, or durability of the structures. Units shall be free of any deleterious matter that will corrode metal. Concrete masonry units that have been subjected during manufacture to a saturated-steam pressure of not less than 120 pounds per square inch for 5 hours or more may be used as soon as cooled. Units that have not been subjected to such steam pressure shall be cured for 28 days or more before delivery. Units shall be delivered to the job site in an air-dry condition, and shall have a linear shrinkage potential not in excess of 0.065 percent as determined by ASTM Standard C426-58T.

(a) Concrete masonry units conforming to ASTM Standard C 129-59, shall be used for all masonry work.

(5) Mortar shall comply with the property specification for type N mortar as set forth in ASTM Standard C 270-59T, except that when tested for water retention, the mortar shall have a flow, after suction of 75 percent or more when mixed to an initial flow of 125 to 140 percent. When tested for compressive strength, the water-retention requirements for mortar stipulated in ASTM Standard C 270-59T shall apply. When used in the work, mortar shall be mixed in the laboratory-established proportions with as much water as may be necessary to produce the workability desired regardless of initial flow. The contractor shall furnish a certified copy of laboratory established proportions and tests as evidence that the mortar used in the work meets the requirements of the property specification as modified herein. No change in the laboratory-established proportions shall be made nor shall materials with different physical or chemical characteristics be utilized in mortar used in the work unless the contractor furnishes additional evidence that such mortar meets the requirements of the property specification as specified herein.

b. Handling and Storage. - Masonry materials shall be stored in an approved manner that will protect them from contact with soil and exposure to the elements.

c. Samples. - The following samples of materials proposed for use shall be submitted to the Contracting Officer and his approval thereof received before materials represented by the samples are delivered to the project site. Representative samples shall be taken periodically from on-the-site stockpiles as required by the Contracting Officer for testing.

(1) Concrete Masonry Units. - All shapes, sizes, and kinds in sufficient numbers to show full range of color and texture.

d. Certificates. - The contractor shall furnish certificates executed in quintuplicate prior to delivery of the certified material to the project site. Each certificate shall be signed by an authorized officer of the manufacturing company and shall contain the name and address of the contractor, the project location, and the quantity and date or dates of shipments or delivery of the material to which the certificate applies. Concrete masonry units shall be certified for compliance with all specification requirements. Aggregates for concrete masonry units shall be certified for compliance with specification requirements for nonstaining and popout properties.

e. Tests for Drying Shrinkage. - Sampling and testing to determine the linear shrinkage potential of concrete masonry units, shall be done by an approved commercial testing laboratory not more than 3 months nor less than 2 weeks before delivery of units to the

project site, and at the expense of the contractor. Three copies of such tests shall be signed by the testing laboratory and countersigned by the contractor and shall be submitted to the Contracting Officer at least 10 days before delivery of units to the project site. No change in manufacturing processes and techniques or in drying and curing procedures shall be made nor shall materials with different physical or chemical characteristics be used in units delivered to the project site unless the contractor verifies the linear shrinkage potential by additional signed test reports.

(1) Samples for Testing. - A sample of 5 individual and whole units representative of the manufacturer's product whose units are proposed for use shall be selected after cooling and/or curing at the point of manufacture. Sample units shall prove under test to be free from cracks or other structural defects, and to have been manufactured with the same type and quality of aggregate, and cured and dried by the same procedures as those to be employed in producing units for use in the work. Units previously subjected to tests involving temperatures exceeding 150 degrees F. shall not be used in drying-shrinkage tests.

(2) Testing shall be done in accordance with ASTM Standard C 426-58T.

f. Test for Air-Dry Condition. - Upon delivery of concrete masonry units to the project site, representative samples shall be selected from stockpiles and tested for air-dry condition. Sampling and testing will be by and at the expense of the Government and will be in accordance with ASTM Standard C 427-58T. Air-dry condition is defined as the moisture condition of a concrete masonry unit in a state of equilibrium with a relative humidity of not greater than 15 percent higher than the average relative humidity at the project site, except that the relative humidity of the unit at equilibrium shall not exceed 85 percent and shall not be required to be less than 50 percent in group I units nor less than 70 percent in group II units. The average relative humidity at the project site shall be as determined by the nearest U. S. Weather Bureau station from the total of annual observations recorded for the month in which the unit is delivered.

g. Test for Mortar. - Test for mortar and to establish the proportions of the mortar to be used on the work shall be done by an approved commercial testing laboratory at the expense of the contractor.

h. Erection. - (1) General. - Masonry shall not be erected when the ambient temperature is below 35 degrees F., except by written permission of the Contracting Officer. No frozen work shall be built upon. No unit having a film of water or frost on its surface shall be laid in the walls. Masonry shall be protected from freezing for 48 hours after being laid. Masonry shall be laid plumb, true to line, with level courses accurately spaced with a story pole, and with each course breaking joints with the course next below. Each unit shall be adjusted to

its final position in the wall while mortar is still soft and plastic. Any unit that is undisturbed after mortar has stiffened shall be removed and relaid with fresh mortar. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces around metal door frames and other built in items shall be solidly filled with mortar. Anchors, wall plugs, accessories, and other items required to be built in with masonry shall be built in as the masonry work progresses. Walls abutting concrete walls shall be anchored thereto with anchors or ties spaced not more than 16 inches on centers vertically. Cutting and fitting of masonry required to accommodate the work of others shall be done by masonry mechanics with masonry saws.

(2) Joints shall be tooled slightly concave with a device of as long length as practicable and so that the mortar will be thoroughly compacted and pressed against the edges of the units. Tooling shall not be done until after the mortar has taken its initial set.

(3) Unfinished work shall be stepped back for joining with new work. Toothing may be resorted to only when specifically approved. All loose mortar shall be removed and the exposed joint shall be thoroughly cleaned before laying new work. Surfaces of masonry not being worked on shall be properly protected at all times during construction.

(4) Mortar that has stiffened because of chemical reaction due to hydration shall not be used. Except as specified below, mortar shall be used and placed in final position within 2-1/2 hours after mixing where air temperature is 80 degrees F. or higher, and within 3-1/2-hours after mixing where air temperature is less than 80 degrees F. Mortar not used within these time intervals shall be discarded. When cement or cements used in the mortar have been tested and the observed time of initial set as determined under ASTM Standard C 266-51T has been ascertained, the time interval during which the mortar must be placed in final position may be determined by an optional method as follows:

Air Temperature in Degrees F.	Time Interval After Mixing
80 or higher	Time of initial set minus 1 hour
Less than 80	Time of initial set minus 1/2 hour

Mortars that have stiffened within the time interval as determined above, because of evaporation of moisture from the mortar, may be retempered by adding water as frequently as needed to restore workability.

(5) Concrete masonry units shall not be wetted before laying. Cutting of units shall be accomplished by masonry mechanics using masonry saws. Concrete units shall be dry cut. Units shall be

set with vertical joints breaking not less than 4 inches over units in the course next below. Mortar joints shall be approximately 3/8 inch wide. Joints shall have full mortar coverage on horizontal and vertical face shells, but mortar shall not extend through the unit on the web edges. Each course shall be bonded at corners.

Jamb units shall be of the shapes and sizes required to bond with wall units. No cells shall be left open in face surfaces.

(a) Partitions shall be continuous from floor to underside of floor construction above.

(b) Lintels in masonry walls shall be constructed using pre-cast concrete lintels. Lintels shall extend at least 8 inches beyond each side of the opening.

i. Pointing and Cleaning. - Before completion of the work, all defects in joints of exposed masonry surfaces shall be raked out as necessary, filled with mortar, and retooled. All masonry surfaces shall be left clean, free of mortar daubs, and with tight mortar joints throughout.

16-07. ROOFING. - a. General. - Roofing shall not start until roof surfaces are smooth, firm, dry, free from dirt and foreign materials, and have been inspected and approved. Vents and other projections through roof shall be properly flashed and secured in position.

b. Materials. - (1) Coal-tar pitch for built-up roofing shall conform to requirements of Federal Specification R-P-381, Type I.

(2) Felt shall be the coal-tar saturated type and shall conform to the requirements of Federal Specification HH-F-201, Type I, No. 15.

(3) Plastic bituminous cement shall conform to the requirements of Federal Specification SS-C-153, Type II.

(4) Surfacing Materials. - Surfacing materials shall consist of screened and washed gravel. Aggregates shall be hard, dry, opaque, and free from elongated, flat and sharp-edged particles, dirt, clay, loam, adherent coatings and any other material or foreign substances that would affect performance and bond or cause deterioration or staining of any metal with which they would come in contact. Grading of the aggregate at time of application shall conform to the following requirements:

Sieve Size (U.S. Standard)	Percent Passing by Weight
3/4-inch	100
5/8-inch	95-100
1/4-inch	0-50
No. 6	0-5

In addition, not more than 0.5 percent, by weight, of the total sample tested, shall pass a No. 200 sieve when tested in accordance with ASTM Method C 117.

c. Application of Roofing. - (1) General. - Coal-tar pitch shall not be heated above 400° F. Rolls of felt shall be stacked in properly protected piles and maintained at a temperature of at least 50° F., for not less than 24 hours prior to laying. Felt and surfacing material shall be dry when applied, and in addition the surfacing material shall be heated in cold weather. Coal-tar pitch shall be hot when applied, and layers of felt shall be laid immediately behind the mop and shall be free of wrinkles or buckles. As each course of felt is mopped into hot bitumen, the top edge of felts shall be carefully broomed-in with an 18- or 20-inch wide soft-fiber-type floor broom to obtain complete adhesion between plies and to close out any air pockets. It is not permissible to mop half the width of sheet and turn back the other half and mop under that portion. Workmen shall not walk on mopped surfaces when the bitumen is in a sticky condition. Each layer of roofing felt shall be carried up abutting vertical surfaces at least 4 inches.

(a) Lapping Felts. - Felts shall be laid with not less than the following laps:

Table I. - Laps for Roofing Felts

Layers or Plies	Laps in inches for 36-inch felt	Starting widths in inches for 36-inch felt
5	29	8, 15, 22, 29, and 36

Vertical laps of roofing felts shall be 6 inches.

(b) Gravel-surfaces, tar, built-up 5-ply roofing on concrete surfaces. - The built-up roofing shall consist of not less than the following quantities in pounds, for each 100 square feet of roof surfaces:

5 layers of coal-tar saturated rag felt	75
Coal-tar pitch	225
Roofing Gravel	400

The concrete surfaces shall be given a uniform coating of hot coal-tar pitch, using not less than 50 pounds on concrete, per 100 square feet. Five layers of coal-tar saturated felt shall be rolled-in immediately after the hot mopping, over the entire roof surface, and lapped in accordance with Table I. Each sheet of coal-tar-saturated felt shall be mopped-in the full width of the lap with hot coal-tar pitch, using not less than 25 pounds per 100 square feet for each mopping.

16-08. CALKING. - a. Materials. - (1) Calking compound shall conform to Federal Specification TT-C-598, grade 1, and shall be delivered to the building site in the manufacturer's original sealed packages. Color shall match the color of the mortar joints.

(2) Sealer. - The sealer for the joint grooves in masonry shall be quick-drying liquid, and of a type and consistency recommended by the manufacturer of the calking compound.

(3) Rope Yarn. - Rope yarn shall be the raveled strands of hemp or jute rope fiber free from oil or other staining element.

b. Application. - Calking shall be installed in joints around metal frames built into concrete exterior walls, and in any other joints so indicated on the drawings and as specified under other sections of these specifications. Calking compound shall be applied by the gun method using nozzles of proper sizes to fit the several widths of the joints. The type of gun shall be subject to approval.

(1) Calking in joints shall be a minimum of 3/4 inch in depth and 1/4 inch in width unless otherwise indicated on the drawings. Where adequate grooves for calking have not been provided, grooves shall be prepared by cutting and cleaning out the concrete to the minimum depth and width, taking care that adjoining metal work is not reduced in section. All particles of mortar, dust, and other foreign matter shall be brushed out and, just prior to calking, the joint grooves shall be coated with an application of sealer. Where a suitable mortar backstop has not been provided, the back of joint grooves shall be tightly packed with rope yarn.

(2) The compound shall be driven into the joint grooves with sufficient pressure to force out all air and to solidly fill the joint grooves. Calking, where exposed, shall be free of wrinkles, and shall be uniformly smooth. Calking around all openings shall include the entire perimeter of each opening. Upon completion of calking, any calked joints not entirely filled shall be roughened and filled as specified and the exposed surface tooled smooth.

(3) The surfaces of all materials adjoining calked joints shall be cleaned of any smears of compound or other soiling due to the calking application. The finished surface shall be primed with aluminum paint and finish painted to match adjacent surfaces.

16-09. ALUMINUM WINDOWS. - a. Samples. - One complete, full-size sample window of each type proposed for use shall be submitted for approval. Sample units shall be taken from manufacturer's stock. Samples shall be complete with hardware, anchors, screens, and other accessories, and shall be finished as specified. Additional samples of hardware items shall be submitted as requested. After approval, samples may be installed in the work provided each sample is clearly identified and its location recorded. Except for varying sizes, windows furnished shall match approved samples.

b. General Requirements. - (1) Conformance to industry specifications. - The contractor shall furnish a certificate from the window manufacturer certifying that the windows conform to the requirements of the applicable industry specifications. However, such certification shall not relieve the contractor from the responsibility to conform to the additional requirements of these specifications. The requirements herein shall govern where there is a difference between these specifications and the referenced industry specifications.

(2) Air Infiltration. - The air infiltration shall not exceed 1 cubic foot per minute per foot of crack length with a wind velocity of 25 miles per hour when tested with the sash closed, locked, and adjusted. The contractor shall furnish duplicate copies of an air infiltration test performed by an approved commercial testing laboratory certifying that the type of windows being furnished meet the above requirement.

(3) Provisions for Glazing. - Unless otherwise detailed or specified, fixed sash and ventilator sash shall be designed for securing glass from inside with metal glazing beads. Metal glazing beads may be integral with sash member or applied. Where vinyl gaskets are used with metal beads for securing glass, the vinyl shall be of light gray color unless otherwise directed and shall be furnished with windows.

(4) Mastic. - Metal to metal joints between members of metal windows and metal frames and elsewhere as required shall be set in mastic of the type recommended by the window manufacturer to provide completely watertight joints. Excess mastic shall be removed before it hardens.

(5) Poles. - One tubular aluminum pole or round hardwood, varnish-finished pole with pulldown hook and one pole hanger shall be provided in each room or space where pole operation of windows is required.

c. Windows. - (1) General Requirements. - Aluminum windows shall conform to the Aluminum Window Manufacturer's Association Specifications for Aluminum Windows except as modified herein.

(a) Cleaning. - After fabrication, fabricating oil, scratches, and tool marks shall be removed from the aluminum surfaces, and the surfaces shall be free from discoloration, blemishes, and defects.

(b) Mill or Etched Finish. - Aluminum surfaces shall have a natural as-fabricated mill finish; or, at the contractor's option, surfaces shall be given a satin finish by caustic soda etching or by standard mechanical methods. Surfaces shall be protected from handling marks until protective coatings are applied.

(c) Protective Coating. - After cleaning and finishing and prior to shipment, two coats of a clear, colorless, methacrylate lacquer shall be applied to all surfaces of the aluminum. The lacquer shall conform to A.W.M.A. Performance Specifications for Clear Coatings for Aluminum Windows.

(d) Protection from dissimilar materials. - In addition to the protective coating specified, aluminum surfaces shall be protected from direct contact with dissimilar materials as follows:

1. Dissimilar metals, including galvanized ferrous metals, but excluding stainless steel and solid zinc sheet, shall be painted with a heavy brush coat of zinc-chromate primer conforming to Military Specification JAN-P-735 & Am-1, and two coats of aluminum paint or a heavy brush coat of alkali-resistant bituminous paint conforming to Military Specification MIL-P-6883, or shall be separated from the aluminum by a heavy coat of mastic calking compound or by a nonabsorptive tape or gasket. Aluminum paint shall consist of aluminum paste conforming to Federal Specification TT-A-468a & Am-1, type II, class B; thinner compatible with the varnish; and varnish conforming to Federal Specification TT-V-119, & Int. Am-1, mixed in the proportion of 2 pounds of paste to not more than 1 pint of thinner to 1 gallon of varnish. The paste, thinner, and vehicle shall be field-mixed.

2. Aluminum surfaces in contact with mortar, concrete, or other masonry materials shall be given one heavy brush coat of bituminous paint conforming to Military Specification MIL-P-6883.

(e) Hardware. - Hardware for aluminum windows shall be cast bronze with a dull chrome finish, white bronze, nonmagnetic stainless steel with a satin finish, or cast aluminum.

(2) Projected Windows. - Projected windows shall conform to A.W.M.A. Specifications for Aluminum Windows for P-A2 commercial type intermediate projected, with modifications as follows:

(a) Where ventilators are more than 6 feet above the floor, hardware for operation by pole shall be provided. The fastener shall be located in the center of the frame.

d. Insect Screens. - (1) Location. - Insect screens shall be provided for all window vents.

(2) General. - Aluminum screen frames shall be provided for aluminum windows. Screens shall fit closely around the entire perimeter of each ventilator or opening, shall be rewirable, easily removable from inside building, and interchangeable for ventilators and openings of the same size. Hardware, guides, stops, clips, bolts, and screws shall be furnished as required for a secure and insect-tight

attachment to window. Material and finish of hardware and finish of screen frames shall be as specified for windows. Horizontal cross bracing of screens shall be provided at approximate center of frames. Bracing shall be located opposite meeting rails or horizontal muntins.

(3) Aluminum-frame screens. - Aluminum-frame screens shall conform to A.W.M.A. Specifications for Aluminum Windows. The frames shall have removable splines of aluminum or vinyl. Screening shall be 18-by-18 mesh and of aluminum conforming to Federal Specification RR-S-141a & Am-1, type VII.

e. Glass. - Glass shall conform to the requirements of Federal Specification DD-G-451, Flat, Type II, A quality, double strength, clear glass.

f. Glazing. - Glass shall be secured in place with beads of stainless steel or extruded vinyl, or a combination of both. Beads shall be of type that can be easily removed to permit reglazing without dismantling or unfastening corners of sash. Glass shall be secured from inside. Prior to setting glass the outside surface of sash in contact with glass shall be coated with an approved type of rubber cement or elastic glazing compound on which the glass shall be bedded.

g. Installation. - (1) General. - Installation shall be done by the window manufacturer or his authorized representative, using only skilled window mechanics. Windows shall be set in prepared openings. Windows shall be set plumb, level, in alinement, and properly braced to prevent distortion. Ventilators and operating parts shall be protected against accumulation of cement, lime, and other building materials by keeping ventilators tightly closed.

(2) Window Anchors. - Window anchors shall be properly spaced not exceeding 24 inches apart and set in masonry openings during progress of wall construction.

(3) Adjustment. - After window installation and completion of glazing and painting, windows and operating hardware shall be adjusted to provide free operation and watertight conditions when sash are closed and locked. Hardware and operating parts shall be lubricated or waxed as required.

(4) Feeler Gage Field Tests. - After installation and adjustment of solid section nonweatherstripped windows in heated buildings, the metal-to-metal contacts between ventilators and their supporting frames shall be such that when the ventilator is closed and locked, a steel feeler gage 2 inches wide by 0.020 inch thick cannot be freely inserted at any point of contact.

h. Protection. - Care shall be used in handling windows during transportation and at the job site. Windows shall be stored at the site on edge and under cover. After installation, windows shall be protected from damage during subsequent construction activities.

i. Cleaning. - Metal surfaces of windows shall be cleaned on both the inside and outside of all mortar, plaster, paint, and other foreign matter to present a neat appearance and prevent fouling of weathering surfaces, weatherstripping, or the operation of hardware. In addition, aluminum windows shall be washed with a stiff-fiber brush and soap and water and thoroughly rinsed with clear water. Where aluminum windows have become stained or discolored, the windows shall be cleaned or have finish restored in accordance with recommendations of the referenced trade association publication. Stained or discolored windows that cannot be satisfactorily repaired shall be replaced with new windows at no additional cost to the Government.

16-10. ALUMINUM LETTERS. - a. General. - The contractor shall furnish and install the aluminum block letters on the intake structures as indicated on the drawings. Shop drawings and photographs of the letters shall be submitted for approval. All surfaces of castings shall be true planes, uniform in size with straight corners and arrises, and parallel lines parallel. All castings shall have a smooth sand finish without apparent pits or fins and any rough projections shall be carefully removed.

b. Castings. - Cast aluminum shall conform to Federal Specification QQ-A-601b, Class 2M, Commercial Alloy 43, with anodized coatings.

c. Lettering. - The size of the lettering shall be as indicated. Lettering shall be "Broadway" and attached as indicated. Standard letter patterns may be used with the provision that the letters, and the method of attachment of base to concrete will be subject to the approval of the Contracting Officer.

16-11. FLASHING. - a. Copper Flashing. - All flashings shall be copper and, unless otherwise indicated or required, shall be 16-ounce cold-rolled copper conforming to Federal Specification QQ-C-576a, for COPPER PLATES, ROLLED BARS, SHEETS, AND STRIPS. Scuppers are specified in Paragraph 16-18 "SCUPPERS" of this section.

b. Soldering. - All edges of uncoated sheet metal to be soldered shall be pretinned before soldering is begun. Soldering shall be done slowly with well-heated coppers so as to thoroughly heat the seam and completely sweat the solder through the full width of the seam. Ample solder shall be used and the seam shall show not less than one full inch of evenly flowed solder. For all materials, soldering shall follow immediately after application of the flux. Upon completion of soldering, acid shall be neutralized and surfaces shall be thoroughly cleaned.

c. Seams. - Seams shall conform to the following requirements:

(1) Standing seams shall finish not less than one inch high.

(2) Flat lock seams shall finish not less than 3/4 inch wide.

(3) Soldered lap seams shall finish not less than one inch wide.

(4) Unsoldered plain lap seams shall lap not less than three inches.

(5) All seams shall be made in the direction of the flow.

d. Expansion Joints. - Expansion joints shall be provided at intervals of not over 30 feet in all continuous runs of sheet metal work.

e. Cap Flashings. - Cap flashings shall turn down over base flashings not less than 4 inches. The upper edge of cap flashing inserted in open-type reglets shall be secured with coiled-copper strips or lead plugs spaced approximately 12 inches on centers. The cap flashing shall be formed to provide spring action against the base flashing.

f. Reglets. - Reglets for flashing to concrete shall be provided and shall be set in the forms where and as shown on the drawings, or required to provide watertight connections. Reglets shall be a manufactured product constructed of sheet copper of approved design and shall be complete with all fittings and special shapes as may be required so as to be weathertight. Reglets of all types shall have edges bent to an angle of at least 45° F., of sufficient width to provide firm and secure anchorage into the wall construction. Open-type reglets shall be fitted with fiberboard or other suitable separators to prevent crushing or filling of the slot during placing of concrete. Reglets shall be secured in the concrete forms with double-head copper nails spaced not over 12 inches on centers. Metal flashing shall be secured in open-type reglets by means of soft copper or lead plugs spaced not over 12 inches on centers, with grooves filled with calking compound and calked smooth after application.

16-12. EXTERIOR HOLLOW METAL DOORS. - a. General. - The contractor shall furnish all material and hardware for, and install complete, the entrance doors, frames, and mouldings for the structures as indicated on the drawings.

b. Material. - All material shall be of the best grade open hearth, cold-rolled, full-pickled, annealed and reannealed patent leveled furniture ingot iron. Gages referred to are all U. S. Standard and are the minimum acceptable for this work. Doors shall be of hollow metal construction, 1-3/4 inches thick and of 16-gage stock. Top and bottom of doors shall have stiffener channels welded to side plates, and shall be reinforced by formed steel, Z-bar sections extending full

height and spaced not over 6 inches on centers. Sound-deadening cork board strips shall completely fill each space. Exposed welds shall be ground to true, even plane with no grinding marks visible. Doors shall be free from warps, dents or buckles. Doors shall be properly reinforced for hardware and shall be drilled and tapped for application of hardware. Backing for hardware shall be not less than 1/8 inch thick and heavier where necessary to develop full strength of machine screws. Doors shall be mortised for butts and reinforcement provided by door manufacturer. Joints and miters shall be welded full length of hair line joints. Fourteen-gage reinforcements shall be provided for all bolts, locks, and lock strikes. All reinforcements shall be securely welded in place. Mortises shall be neat and carefully fitted to hardware items. Any voids between metals and all mortises where hinges pass through rebates shall be filled with metal, welded in place. Astragals shall be provided.

c. Painting. - The doors shall be shop painted and finished in accordance with the standard practice of the manufacturer. The doors before assembling shall be cleaned and primed with one coat of approved rust-resistant paint baked on, followed by one coat of mineral filler baked and rubbed. The doors shall be finished as specified in Section, "PAINTING".

d. Hardware. - The inactive leaf of each entrance door shall have 2 pair butts, one chain bolt on top and a foot bolt. The active leaf shall have 2 pair of butts, lock and door closer.

Hardware Per Set Double Doors

Butts - 2 pair each leaf, Type T-2147 USP, 5" (non-rising, non-removable pins when doors are closed) (weld jamb leaf). Oilite bearing butts may be furnished at contractor's option.

Foot bolt, type 1021B modified for 8"
Chain bolt, type 1021A modified for 8".
Door closer, type 3001, size VI, with corner bracket.
Lock, type 123A-25.
2 Glynn Johnson door holders, Series 70, size as required.

The above hardware shall conform to the applicable requirements of the following Federal Specifications.

FF-H-106a	Hardware, Builders; Locks and Door Trim.
FF-H-111a	Hardware, Builders; Shelf and Miscellaneous.
FF-H-116c	Hinges, Hardware, Builders.
FF-H-121c	Hardware, Builders; Door Closing Devices.

e. Frames. - Channel frames shall be provided as shown. Bar stop shall be plug welded to frame.

16-13. INTERIOR HOLLOW METAL DOORS. - a. Materials. - Steel for doors and pressed steel frames shall be cold-rolled, stretcher-leveled sheet steel, 16 gage for frames and 18 gage for doors and shall have clean smooth surfaces. Doors and frames shall be given a prime coat conforming to Federal Specification TT-P-636b. Frames shall be type and shape indicated, including channel frame for filter chamber access door.

b. Doors. - Doors shall have faces formed from one continuous sheet. Top and bottom of doors shall have stiffener channels welded to side plate, and shall be reinforced by formed steel sections extending full height and spaced not over 6 inches apart, with compressed cork filler strips in each space. All edges of doors shall present a smooth and clean surface. Joints and miters shall be welded full lengths to hair-line joints. Exposed welds shall be ground to true even plane with no marks or grinding visible. Doors shall be free from warps, dents, or buckles. Doors shall be properly reinforced for hardware and shall be drilled and tapped for hardware to be applied. Backing and reinforcing for hardware shall be not less than 11 gage for mortised hardware and 14 gage for surface applied. Doors shall be mortised for butts and reinforcements provided by door manufacturer. Doors shall be neatly and accurately hung in place and left in easy and perfect working order.

c. Hardware, (Per set swing door).
Butts - 1-1/2 pairs, type T-2127USP, 4-1/2" x 4-1/2"
Latch Set - Type 86N-4
Door Closer - Type 3001, Size III with lacquer finish

Hardware type number shall conform to applicable requirements of Paragraph 16-12d.

d. Filter Chamber Access Door. - Door, sill and frame shall be provided as shown. Door shall be secured to frame and sill. Felt shall be provided to make opening air-tight.

e. Air-Tight Swing Doors. - The air-tight doors shall be provided with a neoprene seal for air-tightness as detailed. The door frames shall be capable of receiving the extruded bronze strip housing the neoprene seal around jambs and heads of doors, as detailed. A threshold seal shall be provided on the air-tight doors, and shall be a jamb actuated type to assure an air-tight seal between bottom of door and floor when the door is in a closed position.

16-14. CARPENTRY. - a. Kitchen Cabinets. - Kitchen type cabinets shall conform to the applicable requirements set forth in Section 34, except wood finish shall be paint grade, and to the details indicated.

b. Shelving. - Shelving shall be of any suitable species, second grade for paint finish. Shelving shall be supported on shelf cleats approximately 3/4 inch by 3-5/8-inches, unless otherwise shown. Shelves shall be of the width indicated and be spaced as indicated or directed.

c. Framing. - Framing for fixed storage shall be No. 2 southern pine or Standard grade Douglas fir or other applicable species. Framing shall be closely fitted, accurately set to required lines and grades and securely fastened in place.

d. Finish. - Interior finish, including door frames shall be machine sanded at the mill and sandpapered smooth at the structure where installed. Finish shall be secured with fine finishing nails (set for putty stopping) and with screws and glue where required. Finish shall be set straight, plumb or level, in perfect alignment, and shall be closely fitted. Door trim shall be in single lengths. Species of lumber shall be at option of contractor, second grade for paint finish. Plywood shall be Douglas Fir, Grade B-B, Int.

e. Plywood Doors. - Doors for fixed storage shall be of Grade B-B, In. Douglas Fir, and shall be provided with three butts per leaf (Federal Specification FF-H-116c, Type 2171 USP, 3" x 5"). Hasp shall conform to Federal Specification FF-H-111a, Type F1405, 4-1/2" size. Padlock shall be provided for door and shall be type EPA, Size 1-1/2 (Federal Specification FF-P-101c).

f. Folding Door. - Folding door shall be wood folding, accordian type, suspended from overhead track, shall be assembled at factory and shall be similar and approved equal to "Pella" folding doors, as manufactured by Rolscreen Company, or approved equal. Type of veneer is optional with the contractor. Doors shall be furnished unpainted but sanded and ready for field painting application.

16-15. GOVERNMENT-FURNISHED ITEMS - GATE SHAFT STRUCTURE. - a. Bronze plaque is specified and included in Paragraph 16-19.

b. The following items shall be Government-furnished and contractor-installed.

(1) Contaminated clothes chute.

(2) Membrane door.

(3) Anti back-draft valve.

All additional items required to complete the installation shall be provided by contractor.

16-16. FIRE EXTINGUISHER. - Provide and mount one fire extinguisher, Type II, conforming to Federal Specification 0-E-940, with hanger loop.

16-17. LOUVERS. - a. Fixed Louvers. - Fixed louver for generator intake shall be double offset fixed leakproof style, and fixed louver for generator discharge shall be stationary style, shall be fabricated of aluminum blades securely fastened to rigidly constructed aluminum frame of channel section. Fixed blades and frame shall be No. 14 gage minimum.

b. Screens. - Screen material shall consist of 1/4-inch mesh hardware cloth, aluminum wire in rigid aluminum frame of 1/4-inch mesh galvanized hardware cloth in galvanized or cadmium plated iron frame or 1/4-mesh bronze wire hardware cloth in copper frame.

c. Motorized Louvers. - Motorized louvers shall consist of a set of uniformly constructed aluminum blades with interlocked felted edges. Blades shall be securely fastened to suitable pivot rods which shall be guided in non-ferrous oil-less type bushings of replaceable type or in ball bearing support devices with stainless steel balls and cadmium plated steel races. Blades shall be pivot-connected to a suitable operating bar which shall uniformly position the blades in open or closed position. Movable blades shall be carried in aluminum channel frame. Blades, frame and operating bar shall be constructed of No. 14 gage aluminum minimum. Louvers in the full open position shall afford a minimum of 65% free ventilating area.

d. Damper Motor. - Motors for operation of motorized louvers shall be of the two-position spring return type and shall be suitable for the electric service available. Motors shall be installed complete with all necessary linkage and hardware essential to drive the motorized louver to full open position and hold in that position while energized. Time for full opening of the louver shall be about 30 seconds. Motors shall consist of electrical drive and gears in oil, all mounted within a suitable metal box type housing of leak-proof design which shall be attached to the louver channel or to the building wall.

e. Ductwork. - Ductwork shall conform to applicable requirements of Section 23.

f. Filter. - Filter for air intake louver shall conform to filters specified under Section 24.

16-18. SCUPPERS. - Each scupper shall be installed as shown on the drawings or as directed. All joints shall be locked and soldered. The scupper opening shall be completely lined with 24-ounce copper which shall extend through and project outside of the wall to form a drip on the bottom edge, and shall be formed to return not less than one inch against both faces of the wall or parapet with the outside edges folded under 1/2-inch on the top and sides. The metal lining shall be a little smaller than the scupper opening to allow for expansion and contraction in the connecting metal work. The top and sides of scuppers on the roofdeck side shall be of sufficient length to fold over and be lapped and soldered to the flashing, or be of sufficient length to extend not less than 4 inches into the built-up roofing and shall be formed with a ridge to act as a gravel stop around the scupper inlet. All internal joints shall be locked and soldered. Surfaces to receive the scupper lining shall be coated with plastic cement.

16-19. CANT STRIPS. - Concrete cant strips shall conform to requirements of the light weight concrete fill. Wood cant strips, nailers and blocking shall be of preservative treated fir and shall be installed where indicated on the drawings. Treatment shall conform to Federal Specification TT-W-566a.

16-20. BRONZE PLAQUES. - The bronze plaques with bolts for attaching to the intake structures will be furnished by the Government and installed by the contractor.

16-21. ROOF HATCHWAYS. - Roof hatchways shall be of aluminum similar and approved equal to Babcock-Davis roof hatchway, Model # 4-104 or 6-104 insulated cover and curb and with compensating hinge.

16-22. BRONZE PLUGS. - Bronze plugs complete with brass pipe coupling and chain, in connection with pipe sockets for hatchway guards shall be furnished and installed under this section. Materials shall conform to the requirements of Section 30.

16-23. PAYMENT. - a. Payment. - Payment for all work specified in this section, including lightweight concrete fill and precast concrete lintels, will be made at the applicable lump sum prices for Item No. 69, "Water Supply Intake Tower - Miscellaneous", and Item No. 68, "Flood Control Gate Shaft - Miscellaneous", which prices shall include all costs in connection therewith except those items for which separate payment is specifically provided for elsewhere in the specifications.

b. Other Items. - Other items in connection with the structures for which separate payment is specified elsewhere in the specifications is designated below:

Description

Cement
Reinforcing Steel
Concrete (except lightweight concrete fill)
Waterstops
Miscellaneous Structural Steel
Miscellaneous Metals
Electrical Work
Traveling Cranes
Float Well and Accessories
Air Vent & Accessories
Diesel-Electric Engine Generator Set
Hatchway Covers and Railing
Gates and Accessories
Heating and Ventilating

SECTION 17

FLOAT WELL AND AIR VENT
(Items 70 & 71)
(Index)

Paragraph No.	Paragraph Title	Page No.
17-01	Scope	17-1
17-02	Float Well	17-1
	a. General	17-1
	b. Materials	17-1
	c. Installation	17-1
	d. Cabinet	17-2
	e. Payment	17-2
17-03	Air Vent	17-2

SECTION 17

FLOAT WELL AND AIR VENT
(Items 70 & 71)

17-01. SCOPE. - The work covered by this section of the specifications consists of furnishing all plant, labor, equipment and materials and performing all operations required for the installation of air vent and float well, and accessories, complete, in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the contract.

17-02. FLOAT WELL. - a. General. - The contractor shall install the float well and accessories as shown on the drawings in the Flood Control Intake Structure.

b. Materials. - (1) Miscellaneous metals including black steel pipe and cast iron pipe shall conform to the provisions of Sections 29, 30 and 31.

(2) Cement asbestos pipe shall conform to the requirements of Federal Specification SS-P-351a, Class 150.

(3) Gate valves shall conform to Federal Specification WW-V-58 for "Valves; Cast Iron, Gate; 125 and 250 Pound, Screwed and Flanged (for Land Use)", Type 1, Class A, Designation OF.

(4) Steel flanged fittings shall be American Standard, Class 150.

(5) Gaskets for flanged joints shall be copper jacketed.

(6) Bell and spigot cast iron fittings shall comply with American Water Works Association specifications for Class 150 pipe.

(7) Inlets and other specials shown on the drawings shall be as shown thereon.

(8) Screws shall be manganese bronze.

(9) Globe valves shall be similar and approved equal to Crane Company 125 pound, iron body globe valve No. 351-1/4 flanged and drilled to the American Cast Iron Flange Standard Class 125.

(10) Flexible pipe connections shall be similar or approved equal to the Dresser Steel Coupling, Style 38.

c. Installation. - (1) Piping. - The contractor shall install all piping and appurtenances required for the float well in a workmanlike

manner as shown on the drawings or as directed or in accordance with standard practice. All pipes shall be accurately fitted and shall be worked into place without springing or forcing. The flexible connection at the expansion joint shall be constructed as detailed on the drawings.

(2) Float Well. - The float well shall be installed plumb and true. Variation from the vertical shall not exceed 1/2 inch in the length of the well. The service clamps and the joint between the cast iron adapter and the cement asbestos pipe shall be in accordance with best standard practice and the manufacturer's recommendations.

d. Cabinet. - The cabinet over a float well shall be constructed of No. 16 gage, prime, cold rolled steel, fully pickled, stretcher leveled, resquared, and free from buckle, loose scale, or other surface imperfections. The material shall be dip treated to assure a suitable base for finish. The side panel shall be removable and shall be secured to the cabinet by machine screws as shown and the top shall be punched in accordance with template to be furnished by the Government. Formations shall consist of two right angles at latch side of door, two right angles at hinge side, and one right angle formation at top and bottom. Double wall construction shall be used for drawer fronts. Assembly shall be by electric welding. Box drawers shall be mounted in channel slides with automatic stops, and shall be so constructed as to reduce friction and noise in operation. Drawer pulls, latch handles and bottom edge scribe piece shall be of bronze brush finish, and shall be secured with concealed fasteners.

e. Payment will be made at the contract lump sum price for Item No. 70, "Float Well and Accessories", and shall include all costs for the cabinet, steel pipe supports and all piping, valves and fittings incidental thereto out to and including the inlets to provide for a complete system, as shown on the drawings. The recording instruments, including float, tape and counterweight will be provided and installed by the Government.

17-03. AIR VENT. - a. General. - The contractor shall install the air vent and accessories complete as shown on the drawings. Piping shall be supported for alignment during concreting operations.

b. Materials. - (1) Miscellaneous metals including air intake at gate frames, shall conform to requirements of Sections 29, 30, and 31.

(2) Air vent piping shall confirm to Paragraph 17-02b(2).

(3) Bolts shall be Class C steel conforming to Federal Specification FF-B-571a unless otherwise noted.

(4) Structural steel for supports, transition sections, etc., shall be Type II conforming to Federal Specification QQ-S-741a.

c. Installation. - Installation shall conform to the applicable requirements of Paragraph 17-02. The air vent piping shall be furnished and installed as indicated on the drawings.

d. The gate air vent grille shall be detachable. At each anchor, a hole shall be drilled and tapped for receiving the cap screws used in fastening the grille to the frame. The cap screws shall be of brass or bronze and included with the frame.

e. The vent linings forming the air shaft transition at each gate shall be provided as indicated. The vents shall be installed as shown and shall be braced internally to maintain their shape during placement of concrete; such bracing to be removed after completion of concrete work.

f. Payment. - Payment will be made at the contract lump sum price for Item No. 71, "Air Vent and Accessories" and shall include all costs for the installation of the complete air vent system including air intake connections at gate frames, header, adapter to pipe, steel pipe, transition, vent grille, and all fittings, anchors, steel supports, and air vent grille and frame, and incidentals thereto.

SECTION 18

SLUICE GATES, VALVES AND ACCESSORIES
(Items 79 and 84)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
18-01	Scope	18-1
18-02	Description	18-1
18-03	Design	18-1
	a. General	18-1
	b. Design Stresses	18-2
	c. Computation of Stresses	18-2
18-04	Drawings	18-2
18-05	Materials	18-2
18-06	Workmanship	18-3
	a. General	18-3
	b. Tolerances	18-3
	c. Machine Finish	18-4
18-07	Gate and Gate Stems	18-4
18-08	Gate Frames and Guides	18-5
18-09	Motor-Operated Hoists	18-6
18-10	Hand-Operated Hoists	18-7
18-11	Conduit Lining	18-8
18-12	Wall Thimble	18-8
18-13	Painting	18-8
18-14	48" Control Valve	18-8
18-15	Installation	18-9
18-16	Inspection and Tests	18-9

Paragraph No.	Paragraph Title	Page No.
18-17	Guarantee	18-9
18-18	Tools and Operating Instructions	18-9
18-19	Payment	18-10

SECTION 18

SLUICE GATES, VALVES AND ACCESSORIES
(Items 79 and 84)

18-01. SCOPE. - a. This section covers designing and installing gates, with frames, guides, stems, hoists, conduit linings, control valve and accessories, complete, for the Water Supply Intake Tower and Flood Control Gate Shaft.

b. Any item or part necessary for satisfactory operation of the gates, valves, and accessories shall be installed by the contractor whether or not such part or item is shown on the drawings or mentioned in the specifications.

18-02. DESCRIPTION. - a. The cast iron gates shall conform to Federal Specification QQ-I-652a, Class 60. The gates shall be rectangular in shape and provided with seals to make them watertight within practicable limits when closed. The gates and appurtenant parts shall be the product of a reliable manufacturer who can show at least 5 years of successful experience in the manufacture of similar gates.

b. The gates shall be operated by electric motor or hand operated screw hoists as indicated on the drawings.

c. The conduit linings and wall thimble shall be of cast iron conforming to Federal Specification QQ-I-652a, class 30, and shall be installed at the locations shown on the drawings.

18-03. DESIGN. - a. General. - The contractor shall design the gates with their frames, guides, stems, and hoists. All gates shall be designed structurally for a maximum pool elevation of 591.0. The design shall be such that the gates will be satisfactorily raised and lowered at the speed and load conditions indicated below.

(1) 48" x 96" motor operated gates in Flood Gate Shaft. - 9 inches per minute at all heads up to and including maximum pool elevation.

(2) 36" motor-operated gates in Water Supply Intake Tower. - 12 inches per minute at all heads up to a maximum head of 91 feet above sill elevation.

(3) 48" and 12" hand-operated gates in Water Supply Intake Tower - heads up to 15 feet above sill elevation. - The opening and closing forces shall be based on a coefficient of friction of 0.6 on the gate and shall include allowances for the weight of the gate and gate stem. Streamlining features of the gate leaves, frames, and conduit lining indicated on the drawings shall be incorporated into the design. The gate stem, gate leaf and gate hoist support shall be designed to withstand the forces produced by the maximum torque of the gate hoist motor with resultant stresses not in excess of the 75 percent yield point of the material involved.

b. Design Stresses. - (1) Cast Iron. - A factor of safety of fifteen shall be used for castings subject to severe shock or vibration, a factor of safety of ten shall be used for castings subject to mild shock, and a factor of safety of six shall be used for all other castings. Gate leaves, frames and frame extensions shall be considered to be subject to severe shock, and hoist pedestals shall be considered to be subject to mild shock.

(2) Unit stresses in other materials shall be in accordance with the best current engineering practice, but in no event shall the unit stress exceed 20 percent of the specified minimum ultimate strength of the material to be used.

c. Computation of Stresses. - (1) Computation of stresses shall take into account all dead and live loads, including allowances for impact, acceleration, and deceleration.

(2) Gate Stem. - The gate stem shall be designed as a short column with an l/r not greater than 120. The minimum allowable unit stress in the gate stem in compression shall be determined from the column formula for main members on page 207 of the latest edition of the Steel Construction Manual by the American Institute of Steel Construction.

18-04. DRAWINGS. - a. The drawings show certain required and limiting dimensions and other general requirements for the construction and operation of the gates and hoists, but are not to be taken as defining the detailed design of the gates, hoists and appurtenances.

b. The contractor shall submit assembly and detailed drawings and other information to demonstrate fully that all parts of the equipment will conform to the requirement and intent of the specifications. The information shall be submitted in conformance with the requirements of paragraph SC-4 and shall include the following.

(1) Drawings and data specified in Section 25 covering electrical equipment, including schematic and wiring diagrams.

(2) Design computations of the hoists, gates and gate stems.

(3) Shop drawings of all parts except parts of components which are of standard manufacture.

(4) Manufacturer's assembly drawings or cuts and catalog data of parts or components of standard manufacture showing sizes, ratings, overall dimensions and mounting dimensions.

18-05. MATERIALS. - a. All materials used in the construction of the equipment shall be the best available for the purpose, considering

strength, durability, and the best engineering practice. Unless otherwise specified, all materials shall conform to the requirements of the latest applicable Federal Specifications, or in case there are no applicable Federal Specifications, to applicable specifications of the American Society for Testing Materials. Metal and miscellaneous material shall conform to the requirements indicated on the drawings or referred to in these specifications and when not covered thereby, metals and materials of standard quality shall be furnished. Materials shall be of the classification and grades approved by the Contracting Officer. Products other than those specified herein may be accepted when it is proved to the satisfaction of the Contracting Officer that they are equal in strength, durability, usefulness, and convenience for the purpose intended. In case the contractor desires to use stock material not manufactured specifically for the work covered by these specifications, he shall submit evidence satisfactory to the Contracting Officer that such material conforms to the requirements of the specifications, in which case detailed tests of these materials may be waived. Whenever requested to do so, the contractor shall submit to the Contracting Officer two certified copies of tests of all materials he proposes to use in the manufacture of the equipment. The results of these tests shall be in such form as to afford means of determining compliance with the applicable specifications for the materials tested. The cost of making all the above required tests shall be borne by the contractor. The Contracting Officer shall have the right to select, test and analyze, at the expense of the Government, additional test specimens of any or all of the materials to be used. The results of such tests and analyses shall be considered of equal value to the tests made by the contractor to determine compliance with the applicable specifications for the material used.

b. Unless otherwise specified herein, the requirements of Sections 30 and 31 shall apply to the materials used in the construction of the gates, valves and accessories.

18-06. WORKMANSHIP. - a. General. - All work shall be done and completed in a thorough, workmanlike manner, and shall follow the best modern practice in the manufacture of high grade machinery, notwithstanding any omission from the specifications and drawings. All work shall be done by mechanics skilled in their various trades, and whenever possible all parts shall be made accurately to standard gage to facilitate replacement and repair.

b. Tolerances. - Tolerances and clearances specified on the drawings shall be closely adhered to and the machine work shall in all cases be of high grade workmanship and finish, carefully performed to the satisfaction of the Contracting Officer. Where tolerances or fits are not specified on the drawings, the contractor shall follow the best modern shop practice for equipment of the type covered by these

specifications, due consideration being given to the special nature or function of the parts and to the corresponding accuracy required to secure proper operation.

c. Machine Finish. - (1) The type of machine finish, where not otherwise specified, shall be that most suitable for the part to which it applies. Surfaces shall be machine finished wherever an "f" or other mark denoting machine finish appears on the drawings, and on all other surfaces where necessary to insure proper fitting together of parts. Welding, plugging, or shimming to correct defects of material or workmanship will be permitted only where such defects do not affect the strength or interfere with the correct functioning of the part.

(2) So far as practicable, all work shall be laid out to secure good matching or adjoining unfinished surfaces. Any discrepancy between adjoining unfinished surfaces shall be corrected by chipping, grinding or machining to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on the drawings, and shall be chipped or ground free of wall projections or rough spots.

18-07. GATE AND GATE STEMS. - a. The gates shall be of the pressure seating or unseating type as indicated on the drawings. Each gate leaf shall consist of a rectangular plate with horizontal and vertical ribs. Unseating gates shall be provided with wedges to effect proper seating. The bottom surface of the gate where indicated shall be designed to effect a surface seal with a Babbitt seat flush with the conduit floor. Babbitt shall conform to Federal Specification QQ-T-390, grade 3. The bottom edge of the gate shall be streamlined as shown on the drawings, so that the gate may be operated in part open position without serious vibration. Seal bolts shall conform to Federal Specification QQ-M-80, half hard.

b. Seal Strips. - (1) Flood Control Gates. - The seal strips of the gate leaves shall be constructed of bronze conforming to Federal Specification QQ-L-225, Composition 6. The seal strips shall be machined to a snug fit with their bearing seats to provide watertight joints between seal strips and their respective bearing seats.

(2) Each bearing seat shall be coated with a thin coat of white lead paste mixed in linseed oil, immediately after which the seal strips shall be assembled on their bearing seats in the casting and the seal screws held in place by lock pins or other approved means to prevent loosening. The seal screws shall be of the same material as the respective seal strips. The seal screws for the bronze seals should be provided with a special twist-off head for tightening. (The special head shall project beyond the regular countersunk head and shall be designed to shear off when the screw is tight.) After attaching the seal strips, the sliding surfaces shall be machined to a true plane.

(3) Water Supply Gates. - The gate frame and gate leaf shall have machine finished grooves into which the bronze seal strips shall be pressed and securely anchored in place. The bronze seal strips shall be machined to a true surface after installation on both the gate frame and gate leaf.

c. The gate leaf shall have an integrally cast pocket in the center of the leaf near the top. The pocket shall be reinforced by ribs and shall be fitted for a solid maganese bronze thrust nut. The thrust nut shall be threaded and keyed to the gate stem and shall be designed to withstand the imposed thrust of the gate stem.

d. Each gate shall be provided with a rising type gate stem capable of withstanding the maximum thrust of the hoist and motor. The gate stem shall be made of cold rolled steel. A torque plate at the base of the floor stand shall be provided to eliminate torque in the gate stem. The gate stem shall be of a length to suit the hoist, and shall be furnished in sections of a length to suit the stem guide locations shown on the drawings. The sections of each stem shall be jointed together by solid manganese bronze couplings threaded and keyed to the stems. One coupling shall have left hand threads. Each stem shall be provided with stem guides and steady bearings located as shown on the drawings. All stem guides shall be bronze bushed and adjustable. The bronze bushings in the stem guides shall be securely locked into the guide.

18-08. GATE FRAMES AND GUIDES. - The gate frames shall be cast iron of the standard flat frame, flange frame type as indicated on the drawings and shall have the surfaces machined and drilled to attach to the conduit linings and the front faces machined to take the gate guides and seal strips. Seal strips constructed of bronze as specified below shall be attached to the gate frame and frame extension in the same manner as specified in Paragraph 18-07b for the gate leaf. Frame seal strips shall be of the following composition.

	Percent
Copper	82-83
Tin	6.75-7.5
Lead	4.5-5.0
Zinc	5.0-6.0

Gate frame extension shall be of ample length to permit full length seating when the gate leaf is in the full open position. The gate frames for the flush bottom gates shall be provided with a Babbitt lined bottom seal to provide a seating face flush with the conduit floor to match with the seating face on the bottom of the gate leaf. Babbitt shall conform to Federal Specification QQ-T-390, Grade 3. This bottom frame seal shall be bolted to the frame. The guides shall be of cast iron, of heavy sections reinforced with ribs as necessary. The guides shall be

of sufficient length to permit the gate leaf to be fully within the guide when the gate is in the full open position. Bronze bolts, conforming to Federal Specification QQ-M-80, Class A, half hard, shall be used to fasten the guides to the gate frame and for seal bolts. All anchor bolts and nuts shall be of stainless steel conforming to Federal Specification QQ-S-763b, Class 301 or 321.

18-09. MOTOR-OPERATED HOISTS. - a. The electric-motor driven screw hoist shall be constructed of high grade cast iron, with provisions for attaching stem covers to the top cover plate. A suitable torque plate shall be provided at the base of the pedestal. Electric contactor and push botton cases shall be cast as integral parts of the pedestal or shall be bolted to the pedestal and shall have cast iron covers with machine and gasketed watertight and dust-tight joints. All gears shall be of steel, except for the worm gear, if used, which shall be bronze, and properly designed for the service intended. The gear shafts shall have bronze-bushed bearings and suitable provisions shall be made for lubricating the bearings and gears. Gearing shall be enclosed in dust tight casings.

b. The hoist shall be operated by an electric motor with a handwheel for hand operation of the hoist when desired. The handwheel shall be disengaged by means of an automatic throw-out device so that the handwheel will not revolve during motor operation. An interlock shall be provided to prevent the motor from starting when the handwheel is engaged or provisions shall be made for automatically disconnecting the handwheel when the motor is started.

c. A stem cover pipe shall be fitted with a flange for bolting to the top of the pedestal and a suitable visual indicator shall show the exact position of the gate at all times. Each gate position indicator shall be clearly visible from the hoist push button station.

d. The electric motor shall be a squirrel cage type induction motor mounted in a splash-proof and drip-proof frame. Insulation shall be special Class A, moisture and oil-proof. The motor shall be rated at the horsepower required to give a gate hoisting speed of nine inches per minute and designed to operate at 440 volts, 3 phase, 60 cycles, A.C. The motor shall be the high starting torque, normal starting current type NEMA, Design C, and shall be designed for 30-minute operation at rated load and voltage without exceeding a temperature rise of 55 degrees C. above an ambient temperature of 40 degrees C.

e. The motor control shall consist of a magnetic, reversing type contactor, for starting the hoist motor across the line. Three overload devices shall be provided in each starter. The contactor shall consist of two 3-pole contactor elements mechanically interlocked, and magnetically operated by means of a three-button push button station for raising, lowering, and stopping the gate. Control circuits shall be arranged to provide low voltage protection. The contactor shall be

of ample size for the motor which it is to control and shall be rated for service at 480 volts, 3 phase, 60 cycles, A.C. with 120-volt control circuit transformer.

f. Quick break limit switches shall be provided that will cut out the motor at any predetermined position on the opening movement of the gate. Al electrical torque switch shall be provided in the closing side of the gate movement control and shall be arranged to open the motor circuit when the gate is seated or strikes an obstruction. In addition, a mechanical limit switch shall be provided on the down direction. The switches shall be housed in oil tight cases and shall be equipped with quick-break contacts with micrometer adjustment.

g. The push button control stations shall be provided with watertight enclosures and shall be made an integral part of the hoist stand assembly, with "open", "close" and "stop" buttons plainly indicated. Three indicating lamps, a white lamp for "in-gear", a green lamp for "open" and a red lamp for "closed", shall be furnished on each control station. If the unit has an automatic handwheel release, the white light will not be required.

h. All equipment wiring installed by the manufacturer as part of the equipment shall be placed in suitable ducts cast in the stand or accessories, or shall be run in steel conduit. Insulated wire shall be 600v oil base rubber meeting the requirements for insulated wire and cable as specified under the applicable section on electrical work. The wiring shall terminate at a suitable enclosed terminal block.

i. Unless otherwise specified, all electrical materials, workmanship and test shall be in conformity with the current standard rules, regulations and specifications of the American Institute of Electrical Engineers and of the National Electrical Manufacturers Association.

18-10. HAND-OPERATED HOISTS. - a. The hand-operated hoists shall be a manufacturer's standard product, made of cast iron and suitable for manual operation. When operating by hand the required pull on the handwheel or crank to open or close the gate should not exceed 40 pounds. The hoist shall be fitted with a bronze operating nut, antifriction bearings of ample capacity to carry the thrust load on the nut and other genring. Gears shall be steel with machine cut heat treated teeth to resist excessive wear. Suitable provision shall be made for manual lubrication of all working parts subject to wear.

b. Torque Plate. - The floor stand shall be mounted on a torque plate to prevent stem twist mounting. Bolts of ample size shall be provided to attach the torque plate and floor stand and to anchor the torque plate to the foundation.

c. Stem Cover. - The gate stem shall be protected by a cylindrical cover with a cap and a flange for attaching to the top of the floor stand.

d. A suitable gate position indicator shall be provided and mounted on the floor stand in such a manner that the operator can observe the position of the gate at all times.

18-11. CONDUIT LINING. - The cast iron conduit linings conforming to Federal Specification AA-I-652a, Class 30, shall be furnished as indicated on the drawings.

18-12. WALL THIMBLE. - a. The wall thimble shall be cast iron, type "F", twelve-inch depth, with a machine finished face for contact with the gate frame. The thimble shall be equipped with studs and bronze nuts for the gate.

b. All active bolts, studs, nuts, adjusting screws and studs holding gate frame to wall thimbles shall be made of bronze stock conforming to Federal Specification QQ-B-636b, Composition No. 1, half-hard.

18-13. PAINTING. - Before exposure to the weather and after thorough cleaning to remove all rust, dirt, grease, and other foreign matter, sluice gates, valves, floor stands, cranks, and similar parts customarily finished at the shop shall be given coats of paint filler and enamel, or other approved treatment customary with the manufacturer. Ferrous surfaces obviously not to be painted shall be given a shop coat of grease or other suitable rust-resistant coating. Painting shall conform to the requirements of Section, PAINTING.

18-14. 48" CONTROL VALVE. - The 48" control valve shall be the disc-arm pivot valve type designed for a water working pressure of 150 pounds and shall operate at all heads up to and including the maximum pool elevation of 591.0. The body shall be made of cast steel and shall be heavily ribbed to support the thrust of the hoist. The seat ring shall be of Babbitt accurately finished. The disc shall be made of cast steel with edge accurately machined to fit tightly in the Babbitt seat of the body. The disc and operating arm shall be designed to offer the minimum resistance to flow. The main spindle shall be of forged steel and shall be pressed into the disc. Heavy renewable bronze bearings shall be provided for all moving parts. The bearings for the main spindle shall have adjustable rings which bear against bronze washers in the ends of the disc hubs, to insure tightness at these points. The spindle bearings shall be provided with fittings for force feed lubrication. Bronze bearings shall be provided in the arms of the disc, in the crosshead, and in the ends of connecting rod. The pins in the ends of the connecting rod shall be of rolled bronze. The crosshead guide shall be of cast-iron or cast-steel securely bolted to the top of the body and shall be lined with seamless bronze tube. The crosshead shall be of bronze and shall be provided with packing to prevent leakage up through the crosshead guide. The rod connecting the disc arm to the crosshead shall be of forged steel with an eye at each end fitted with heavy bronze bushings. The stem connecting the crosshead to the hoist shall be of

cold rolled steel. The hoist shall conform to the requirements of Paragraph 18-09, "Motor Operated Hoists".

18-15. INSTALLATION. - The gates, gate hoist and accessories, including conduit linings or wall thimble, shall be assembled and installed complete as indicated on the drawings, under the supervision of a representative of the gate manufacturer, and as directed. The gate frame guides and the conduit linings shall be assembled in place and bolted together. The gate leaf shall be placed in the assembled frames and the guides securely bolted to them. The assembled units shall then be checked for alignment and elevation, and the structures shall be substantially anchored in place. After the form work is completed at the ends of the conduit linings, the concrete shall be carefully placed around the frames specified. All bolts, special tools, marks and other devices necessary to erect the gates and linings, and any special anchors required to secure the assembled parts while they are being concreted in place, shall be furnished with the gates. The gate hoists shall be installed in correct alignment with the gates. The gate stems shall be coated with grease with a soap base or other approved compound for protection against rust. All electrical connections shall be made to the motor operated hoists. The limit switches to cut off the motor at each end of the gate travel shall be accurately set at the time of installation. The gate position indicators shall be accurately adjusted at the time of installation.

18-16. INSPECTION AND TESTS. - a. The gates and accessories shall be assembled in the shop as directed for inspection and to insure that all parts fit accurately and are in proper alignment. Each gate shall be opened and closed to insure proper operation.

b. After completion of the gate structure and gate house and the installation of all machinery, each gate shall be tested under the supervision of gate manufacturer's representative for satisfactory operation by being raised and lowered at least three times for its full length of travel. Any adjustment in the setting or installation required to secure satisfactory operations and tight closure of the gates shall be made by the contractor. The gate hoists and motors shall be tested as directed and any adjustments or changes that may be required, in the opinion of the Contracting Officer, shall be done by the contractor.

18-17. GUARANTEE. - The gates, valves and accessories to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions of the SPECIAL CONDITIONS.

18-18. TOOLS AND OPERATING INSTRUCTIONS. - The contractor shall furnish a complete set of all special tools needed for the adjustment operation and maintenance of the gates, valves, and accessories; five complete, bound lists of parts with necessary illustrations and references to permit convenient ordering of repair parts; and five bound complete, clear and concise sets of instructions for the operation,

adjustment, lubrication and maintenance of the gates, valves and accessories furnished under this section.

18-19. PAYMENT. - a. Payment for designing, furnishing and installing the gates, guides, frames, valves, stems and hoists, and conduit linings will be made at the applicable contract prices for Item Nos. 79 and 84, "Gates and Accessories". Payment shall include all necessary accessories not included under any other item and all costs of furnishing the services of a representative of the gate manufacturer.

b. Partial payment up to 70 percent of the contract price for each item but not exceeding the manufacturer's price to the contractor will be made when the equipment has been satisfactorily shop tested and delivered complete at the site of the work.

c. Final payment of the contract prices will be made after the field tests are satisfactorily completed in accordance with Paragraph 18-16.

d. Payment for testing shall be included in the contract price for "Gates and Accessories".

SECTION 22

TRAVELING CRANES
(Items 80 and 85)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
22-01	Scope	22-1
22-02	Applicable Specifications	22-1
	a. Shaft Steel	22-1
	b. Steel Springs	22-1
	c. Crane Wheels	22-1
	d. Wire Rope	22-1
	e. Set Screws	22-1
	f. Machine Screws	22-1
	g. Cap Screws	22-2
	h. Washers	22-2
	i. Rails	22-2
	j. Specifications	22-2
	k. General Design	22-2
22-03	Type and Description	22-2
22-04	Capacities and Speeds	22-3
22-05	Workmanship	22-3
22-06	Design Requirements	22-3
22-07	Materials	22-3
22-08	Bridge	22-4
22-09	Bridge Trucks	22-4
22-10	Wheels	22-4
22-11	Bearings	22-4
22-12	Bridge River	22-4
22-13	Trolley	

4/9

Paragraph No.	Paragraph Title	Page No.
22-14	Trolley Drive	22-5
22-15	Hoisting Drums	22-5
22-16	Hoisting Ropes	22-5
22-17	Sheaves	22-5
22-18	Hoisting Blocks	22-5
22-19	Gears and Shafts	22-5
22-20	Load Brake	22-5
22-21	Operating Wheels and Chains	22-5
22-22	Brakes	22-6
	a. General	22-6
	b. Electric Supply	22-6
	c. Control Box	22-6
	d. Motor	22-6
	e. Limit Switches	22-6
	f. Overload Cutoff	22-6
22-24	Safety Devices	22-7
22-25	Bolts and Nuts	22-7
22-26	Lubrication	22-7
22-27	Wrenches and Tools	22-7
22-28	Name Plate	22-7
22-29	Field Tests	22-8
22-30	Painting	22-8
22-31	Guarantee	22-8
22-32	Payment	22-8

SECTION 22

TRAVELING CRANES

(Items 80 and 85)

22-01. SCOPE. - This section covers the designing, manufacturing, painting, delivering, installation, field testing and placing in satisfactory operation the overhead travel cranes in the Water Supply Intake Tower and the Flood Control Operating House, complete, with all appurtenances.

22-02. APPLICABLE SPECIFICATIONS. - The folliwing specifications form a part of this specification.

a. Shaft Steel. - Steel for shafting shall conform to one of the following specifications:

(1) Federal Specification QQ-S-633a for "Steel Bars, Carbon, Cold Finished and Hot Rolled (General Purpose)."

(2) Federal Specification QQ-S-624a for "Steel Bars, Alloy, Cold Finished and Hot Rolled (General Purpose)".

(3) Applicable specifications of the Society of Automotive Engineers, Inc.

(4) Applicable ASTM specifications.

b. Steel Springs. - Steel springs shall conform to the requirements of ASTM designation A125-52 for "Heat-treated Helical Spings".

c. Crane Wheels. - Steel for the tridge and trolley wheels shall conform to the applicable requirements of ASTM designation A57-60 for "Multiple-Wear Wrought Steel Wheels," Class C, Rim treated.

d. Wire Rope. - Wire rope shall conform to the requirements of Federal Specification RR-W-410a for "Wire Rope and Wire Strand," Type 1, Class 3, 6 x 37, improved plow steel, fibre core, preformed, regular lay, uncoated.

e. Set Screws. - Set screws shall conform to the requirements of Federal Specification FF-S-103a for "Set Screws".

f. Machine Screws. - Machine screws shall conform to the requirements of Federal Specification FF-S-92 for "Screws, Machine; Slotted or Cross-recessed".

g. Cap Screws. - Cap screws shall conform to the requirements of Federal Specification FF-S-85 for "Screws, Caps, Slotted and Hexagon Head" or Federal Specification FF-S-86 for "Screws, Cap, Socket Head".

h. Washers. - Unless otherwise specified or indicated on the drawings, cut washers shall conform to dimensions specified in ASA B27.2-1958, "Plain Washers" for size bolts used. Lock washers shall conform to the requirements of Federal Specification FF-W-84 for "Washers, Lock (Spring)" or ASA B27.1-1958 for "Lock Washers," heavy spring type.

i. Rails. - Rails shall conform to the requirements of ASTM designation A1-58T for "Open-Hearth Carbon Steel Rails", No. 1 rails, ASCE section.

j. Specifications. - Unless otherwise specified, all applicable requirements in Sections 30 and 31 shall also form a part of this section.

k. General Design. - The Overhead Electric Crane Institute Specification 49 shall govern design where applicable.

22-03. TYPE AND DESCRIPTION. - The cranes to be furnished and installed under this section shall be of the indoor, overhead travelling type, equipped with a single trolley having a single electric motor-operating hoist. The crane in the Water Supply Intake Tower shall be of the top running, double beam type. The crane in the Flood Control Operating House shall be of the top running single beam type. The double beam crane shall be provided with an auxiliary I-beam trolley complete with load bar, having a capacity of 1,000 pounds and installed on the upstream beam of the crane. The bridge travel and trolley travel shall be hand operated. The electric motor-operated hoists shall be equipped with pendant controls operable from the main floor of the buildings. Power shall be supplied to the cranes as shown on the electrical drawings.

22-04. CAPACITIES AND SPEEDS. - The capacities and speeds of the cranes shall be as follows:

1.	Rated capacity of hoist, tons	5
2.	Hoist speed, feet per minute	20
3.	Bridge travel speed, feet per minute	Hand operation
4.	Trolley travel speed, feet per minute	Hand operation
5.	Span and lift	As indicated on drawings

22-05. WORKMANSHIP. - Workmanship shall be of the highest grade and in accordance with the best modern standard practice. Parts shall be machined carefully and accurately to jigs and templates, and all like parts shall be absolutely interchangeable. All parts shall conform accurately to the required dimensions and shall be free from defects. All bolt holes shall be drilled accurately to template to the locations called for on the approved shop or working drawings. All machined surfaces shall be faced true. All working parts shall be arranged for convenient inspection, lubrication, adjustment, repair and replacement. After the parts have been accurately fabricated and finally machined, the cranes shall be completely assembled and adjusted in the shop, and there shall be no later fitting or changing of any dimensions on the shop drawings to make the different parts fit properly together.

22-06. DESIGN REQUIREMENTS. - Each crane shall be of standard manufacture, and designed for the purpose for which it is to be used. The crane shall operate within the space shown on the plans, with adequate clearances. Structural design shall be in accordance with the American Institute of Steel Construction (A.I.S.C.) Standards, with factor of safety of not less than five (5) when under the rated capacity loads and based on the ultimate strength of the material used.

22-07. MATERIALS. - No material shall be used for any purpose for which it has not been previously used for a suitable length of time to prove its adaptability for the purpose intended. Before starting the fabrication or manufacture of the cranes, the contractor shall submit to the Contracting Officer for approval specifications covering composition of materials to be used. If requested, test bars and samples shall be submitted. Materials not meeting these specifications or failing to conform to tests shall not be used. All materials used in the crane manufacture shall be of first class quality.

22-08. BRIDGE. - The bridge shall consist of steel riveted or welded girders, or rolled steel beams of suitable size and section, properly reinforced by diaphragms and stiffeners to withstand all strains of loading and impact during operation. The operating machinery and other exposed parts shall be suitably housed so that the exterior of the crane will consist of smooth surfaces of pleasing appearance. Girders shall be so designed that stresses produced in the lower flange by the maximum load shall not exceed 1/5 of the ultimate strength of the material, while the stresses in the top flange shall be limited to the crippling formula employed for compression members, and by lateral strains, due to starting and stopping of the bridge suddenly when fully loaded. The maximum vertical deflection of the girders, produced by the dead load, the weight of the trolley, and the rated load, shall not exceed .00125 inch per inch of span. Impact shall not be considered in determining deflection. Girders shall be rigidly connected with the end trucks, and shall be of such design and construction as to keep the

entire bridge structure square and in alignment under all operating conditions. The trolley track rails shall be welded to the tops of the bridge girders, and shall be provided with approved type of end stops.

22-09. BRIDGE TRUCKS. - The bridge trucks shall be of steel construction, thoroughly braced, welded or riveted, and attached to the girders with turned bolts, with all holes drilled and reamed after assembly of parts. Safety lugs shall be provided to prevent excessive drop in case of axle failure. Substantial guards shall be provided in front of each wheel and shall project below the top of the runway rail. The entire truck shall be machined as a unit, so that perfect alignment of all parts is assured. Bridge trucks shall have approved roller bearings, and heat treated chrome nickel steel axles of the rotating or fixed axle type.

22-10. WHEELS. - Bridge truck and trolley wheels shall be double flanged cast iron, chilled iron, or steel, of ample size, machined to uniform diameters. Axles on trolleys shall have anti-friction roller bearings and shall be mounted so as to be easily removable. One wheel at each end of the bridge shall be driven by the cross shaft. The driving pinions and gears shall be protected by approved guards.

22-11. BEARINGS. - Anti-friction roller or ball bearings shall be used on the trolley and bridge wheels and gear shafts. The cross shaft and other slow speed intermediate shafting may be equipped with sleeve type bearings having removable bronze linings, in accordance with the best engineering practice for the application under consideration. The hook shall turn on ball or roller bearings. The roller and ball bearings shall be Timken, Hyatt, S.K.F., or approved equal. The bearing housings shall be split or so designed as to permit easy removal of the shafts. All bearings shall be provided with oil bath or pressure lubrication, and shall be designed, as far as practicable, to exclude dirt and to prevent leakage of oil or grease.

22-12. BRIDGE DRIVE. - The crane shall be driven by one wheel at each end of the bridge. The operating wheel for the pendant chain shall be located as shown on the drawings. The crane shall be driven at each end from a cross shaft, running the full length of the bridge. The cross shaft shall be of ample size, and shall be supported at frequent intervals to prevent undue deflection or whipping.

22-13. TROLLEY. - The trolley frame shall be of welded rolled steel, or cast steel construction, or a combination of both. The frame shall be a rigid unit, designed to transmit the load to the bridge rails without undue deflection. Safety track guards, the same as specified for bridge trucks, shall be provided. Where practicable, all brackets and bearings shall be permanently attached to the trolley frame.

Drum bearings and supports for upper sheaves shall be located so as to equalize the load to track wheels as nearly as possible. The entire trolley frame shall be machined as a unit, so that perfect alignment of all parts is assured. The trolley shall be provided with suitable bumpers at each end, arranged to meet the end stops squarely.

22-14. TROLLEY DRIVE. - The trolley shall be driven by one driving wheel on each side of the trolley. The trolley drive mechanism for the pendant chain shall be located as shown on the drawings.

22-15. HOISTING DRUMS. - The hoisting drums shall be made of high grade cast iron or steel, and shall be designed to withstand the maximum bending and crushing loads. The drums shall be so designed that not less than two complete wraps of hoisting rope will remain in the grooves when the hook is at the lowest position for the lift specified. Drum grooves shall be turned from the solid metal. The drums shall be grooved right and left hand. The pitch diameter of the drum shall be that required by the rope manufacturer for the size and kind of rope used.

22-16. HOISTING ROPES. - The hoisting ropes shall be of proper design and construction for crane service. The stresses used in the design of the rope shall not be greater than 1/5 the nominal breaking strength of the rope.

22-17. SHEAVES. - All sheaves shall be made of cast steel or cast iron. Sheaves shall be provided with bronze bushings or anti-friction bearings, and shall have finished grooves of ample depth. The pitch diameter of the sheaves shall be that required by the rope manufacturer for the size and kind of rope used.

22-18. HOISTING BLOCKS. - The hoisting blocks shall be of steel construction. The hooks shall be forged steel, supported on a ball or roller thrust bearing. The hooks shall rotate freely on the bearing support.

22-19. GEARS AND SHAFTS. - All pinions shall be suitably heat-treated, forged alloy steel. All other gears shall be of annealed cast steel, forged steel, or welded and heat-treated steel. All gear teeth shall be machine cut. No gears or pinions shall be overhung. All shafts and truck axles shall be of forged steel. All shafts, except the bridge drive cross shaft, shall be machined true to size at gear seats and bearings. All shafts shall be removable without removing any parts keyed to them.

22-20. LOAD BRAKE. - Each hoist shall be equipped with an approved type of automatic load brake designed to automatically hold the load, and

4/1

lower it without acceleration, under full control, by pulling the operating chain in the lowering direction.

22-21. OPERATING WHEELS AND CHAINS. - The operating wheels shall be shrouded and shall be equipped with swinging chain guides that will permit the rapid handling of the operating chain without "gagging" of the wheel, and will also permit a reasonable side pull on the chain. The pendant operating chains shall be sheradized.

22-22. BRAKES. - The hoists shall be provided with two independent braking means (1) an automatic mechanical load brake; (2) an electric motor brake. Either the automatic load brake or the motor brake alone shall be sufficient to sustain the rated load in any position.

22-23. ELECTRICAL WORK. - a. General. - All electrical equipment, material, and workmanship shall conform to the applicable current standard rules, regulations, and specifications of the American Institute of Electrical Engineers, the National Electrical Manufacturers Association, the Underwriters Laboratories, Inc., (N.E.C.), American Standards Association and Section, INTERIOR ELECTRICAL WORK, of this specification. All motors shall be insulated with special Class A moisture and oil proof insulation.

b. Electric Supply. - The electic supply will be 440 volts, 3 phase, 60 cycles.

c. Control Box. - The control box including a full voltage magnetic starter shall be mounted on the hoist and the unit properly balanced. The pendant push button box shall have 4 sets of buttons, 2 for up-down of hoist, one for inching and a dead man button.

d. Motor. - The motor shall be of the squirrel cage type, and shall have ample capacity for the duty and speeds as specified herein. The capacity of the motor shall be such that the specified performance of the crane at rated load will not demand more than full load motor torque. The motor shall be insulated with special Class A moisture and oilproof insulation.

e. Limit Switches. - Limit switches shall be provided to control the upper limits of travel of the crane motor. The limit switch shall be of the totally-enclosed safety type operated by the hook or hook block. The switch shall be readily accessible for adjustment and repair and shall be reset by reversing the travel of the hook. A suitable enclosed type limit switch shall also be provided to control the lower limit of travel of the hoist.

f. Overload Cutoff. - Each hoist shall be equipped with a capacity or load limiting device capable of sensing the load on the

hoisting cable. Such service, upon sensing a load greater than 25% of overload, shall interrupt the raising circuit and prevent the hoist from raising the load. The cutoff shall automatically reset upon the removal of the overload. The overload-cutoff shall not increase the minimum headroom. It shall permit easy cable replacement. The overload cutoff shall not reduce the safety factor of five to one minimum.

22-24. SAFETY DEVICES. - The contractor shall provide all appliances necessary to assure that the cranes shall comply with all applicable safety laws.

22-25. BOLTS AND NUTS. - All bolts and nuts shall conform to the Federal Specification FF-B-571a for "Bolts, Nuts, Studs, and Tap Rivets (and Material for Same)", Class B, and shall be American Standard heavy dimensions, semi-finished with hexagonal heads and cold punched hexagonal nuts. All bolts and nuts shall have clean, true threads, and Class 2 fit. Nuts for bolts subject to vibration and frequent changes of load shall be secured by effective locking devices. If double nuts are used, both shall be of standard thickness.

22-26. LUBICATION. - Lubrication of all mechanical operating parts shall be by means of high-pressure grease, and industrial button-head type fittings shall be used. The lubricating fittings of journals or bearings shall be readily accessible and, where necessary, shall be piped to convenient points, using copper or brass pipe of ample size, adequately fastened. The contractor shall provide a hand-operated grease gun for supplying the lubricant for each crane. The grease gun shall have a capacity of approximately 14 ounces. The grease gun shall be screw-operated by means of a large wing handle, and shall be complete with heavy duty, flexible, metallic hose and pull-on coupling suitable for the button-head type fittings.

22-27. WRENCHES AND TOOLS. - A complete set of wrenches and tools in a pressed-steel tool box shall be furnished for each crane. The tools shall be of sufficient quantity, variety, and type to cover all ordinary maintenance uses in connection with the crane. Each tool and wrench shall be stamped so as to be easily identified as to its size and use. Provision shall be made in the tool box for mounting the grease gun specified in Paragraph 22-26.

22-28. NAME PLATES. - The name plate showing the rated capacity of each crane shall be attached to one bridge girder in an approved location, so as to be legible when viewed from the operating floor. The crane manufacturer will be permitted to supply and attach to the crane structure, in an approved location, a name plate showing the manufacturers name and address and the trade name of the equipment.

22-29. FIELD TESTS. - After installation of the crane has been completed and as soon as conditions will permit,the crane will be subjected to field tests under actual operating conditions to determine compliance with the specifications, and to demonstrate that the equipment has been properly erected, adjusted and in perfect operating condition, ready for service. Should any defects develop during the tests, the contractor shall, without expense to the Government, correct such defects as are due to faulty design, manufacture, or defective materials and workmanship. The tests will include the recording of lifts, and the operation of the load brake with full rated load. The field tests shall be made under the supervision of the contractor and will be observed and witnessed by the Contracting Officer. The method of making the tests shall be subject to the approval of the Contracting Officer. All necessary apparatus and equipment, materials and instruments required for the tests shall be furnished by the contractor. The services of the Manufacturer's Erecting Engineer, necessary for tests, will be included in payment under the contract lump sum prices for Items "Traveling Cranes". The decision of the Contracting Officer as to whether or not the contractor has fullfilled his obligation under the contract shall be final and conclusive.

22-30. PAINTING. - Unless otherwise approved or specified, the cranes shall be painted in accordance with Section 40, PAINTING.

22-31. GUARANTEE. - The overhead cranes shall be guaranteed in accordance with the guarantee provisions of the SPECIAL CONDITIONS.

22-32. PAYMENT. - Payment will be made for the furnishing and installation of each crane will be made at the applicable lump sum contract prices for Items Nos. 80 and 85, "Traveling Crane". Each price shall cover the cost of all labor, material, and equipment, and performing ofoperations in connection with the installation of the crane including any piping, fittings, fixtures, and appurtenances, and all other items incidental to completion in accordance with the specifications herein and the applicable drawings.

SECTION 23

DIESEL, ENGINE-GENERATOR SET
(Item 81)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
23-01	Scope	23-1
23-02	General	23-1
	a. Rating	23-1
	b. Contract Drawings	23-1
	c. Standard Products	23-1
	d. Material and Equipment Schedule	23-1
	e. Shop Drawings	23-2
	f. Operating Instructions	23-2
	g. Miscellaneous Items	23-2
23-03	Diesel-Engine	23-2
	a. General	23-2
	b. Fuel Injection System	23-3
	c. Lubricating Oil System	23-3
	d. Cooling System	23-3
	e. Air Exhaust for Radiator	23-4
	f. Automatic Starting Equipment	23-4
	g. Governor	23-5
	h. Overspeed Stop	23-5
	i. Engine Control Panel	23-5
	j. Flexible Coupling	23-6
	k. Exhaust Piping	23-6
	l. Insulation	23-6
23-04	Generator	23-6
	a. General	23-6
	b. Bearings	23-7
	c. Slip Rings	23-7
23-05	Exciter	23-7
23-06	Fuel Oil Storage Tank and Piping	23-7

Paragraph No.	Paragraph Title	Page No.
	a. Piping	23-7
	b. Fuel Oil Starting Tank	23-7
	c. Fuel Oil Transfer Pump	23-7
	d. Hand-Operated Fuel Pump	23-8
	e. Fliw Indicator	23-8
23-07	Installation	23-8
23-08	Painting	23-8
23-09	Field Tests	23-8
23-10	Guaranty	23-9
23-11	Payment	23-9

SECTION 23

DIESEL ENGINE-GENERATOR SET
(Item 81)

23-01. SCOPE. - This section covers the furnishing and installation of the diesel engine-generator set complete.

23-02. GENERAL. - The set shall consist of a diesel engine, directly connected through a flexible coupling to a revolving field synchronous-type alternating-current generator with a direct-connected exciter, all mounted on a common cast iron or structural steel base and bolted to the floor. The set shall be equipped with a storage battery and electric starting motor, a battery-charging generator, fuel-oil tank, piping, exhaust pipe with silencer, and all other necessary appurtenances for a complete installation. The set shall include a suitable exciter field rheostat for mounting on the steel control panel which shall be installed according to Section, ELECTRICAL WORK, INTERIOR. This paragraph and paragraphs 23-04 and 23-05 describe conventional generator-exciter equipment. However, equivalent equipment of the same output rating having no brushes and using rectified AC for the excitation system may be furnished in lieu of the conventional equipment, subject to approval of the Contracting Officer.

a. Rating. - The generator shall be 3-phase, 480 volt, 60 cycle, 1800 rpm, 3 wire type and shall have an output rating of 75 kw, 93.75 kva., at 80 percent power factor.

b. Contract Drawings. - The contract drawings indicate the general arrangement of the generator set together with its storage tank, silencer, piping accessories. If any departures from the contract drawings are proposed by the contractor, details of such departures and the reasons therefor shall be submitted to the Contracting Officer for approval. No such departures shall be made without written approval of the Contracting Officer.

c. Standard Products. - The engine, generator, and all equipment, materials, and accessories shall be essentially standard products of manufacturers who have had at least 5 years experience and are regularly engaged in the production thereof. Where two or more units of the same class of equipment are required, those units shall be products of a single manufacturer; however, component parts of the system need not be the products of the same manufacturer.

d. Material and Equipment Schedule. - As soon as practicable before commencement of installation of any material or equipment, a complete schedule of the material and equipment proposed for installation

4/1

plete schedule of the material and equipment proposed for installation shall be submitted for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, and complete technical data including rating curves.

e. Shop Drawings. - Complete shop drawings of the engine-generator sets shall be submitted to the Contracting Officer for approval in accordance with Part II, SPECIAL CONDITIONS. The drawings shall show details of installation including electrical connections and shall be fully dimensioned.

f. Operating Instructions. - Complete operating and lubricating instructions, mounted in glass-covered wood frames shall be provided for each unit and shall be posted convenient to the equipment when directed by the Contracting Officer.

g. Miscellaneous Items. - The diesel engine shall be furnished with the following miscellaneous items:

(1) Special tools for regular operation, maintenance, and overhaul of engine.

(2) Two spare injector nozzles.

(3) Engine foundation bolts and sleeves shall be furnished with the engine and delivered to the site prior to delivery of the engine, together with manufacturer's installation instructions. Bolts and sleeves shall be installed by the contractor at the time of pouring the concrete foundation for the engine.

23-03. DIESEL-ENGINE. - a. General. - The engine shall be a full diesel vertical or vee type, two or four cycle, mechanical injection, single acting, or opposed trunk piston type, capable of operating continuously on No. 2 Diesel Fuel Oil. The engine shall conform to the manufacturer's standard design and construction for engines of this type and rating. The net horsepower rating, minimum engine equipment, governor performance, torsional vibration, critical speeds and construction of fully assembled engine generator set, materials and workmanship, shall conform to DEMA "Standard Practices". The engine shall not be required to operate at a rating higher than the manufacturer's published ratings for the speed at which the engine is offered, and after deducting the power consumed by the attached engine-driven auxiliaries, the net brake horsepower continuous rating shall not be less than the power required by its direct connected alternator and exciter when delivering its full rated KW capacity at 80% power factor. The engine shall, further, be capable of delivering for two continuous hours, without smoke

or damage to the engine, 10% more horsepower than required by the unit at rated KW output. The B.M.E.P. at the above specified rating shall not exceed 85 p.s.i. for two-cycle and naturally aspirated four-cycle engines; and 135 p.s.i. with intercooler or 120 p.s.i. without intercooler for four-cycle supercharged engines. The rotative speed of the engine at the specified ratings shall not exceed 1,800 r.p.m. The cylinder block shall be of one piece construction with removable liners. Main and connecting rod bearings shall be of the precision removable type. Engine of the two-cycle type shall be equipped with a built-in engine-driven scavenging blower. Engine of the four-cycle type may be either naturally aspirated or supercharged; however, the maximum cylinder pressure of a supercharged engine shall not exceed that of the same engine normally aspirated by more than five percent.

b. Fuel Injection System. - The fuel injection system shall be mechanical type with individual pump and injection nozzle for each cylinder or single pump with individual injection nozzles for each cylinder. A full flow strainer and full flow oil filter shall be provided and mounted on the unit. All fuel oil piping for the engine shall be installed complete including connections to the fuel oil storage tank.

c. Lubricating Oil System. - The lubricating oil system shall be of the pump pressure type with the pressure being supplied by a built-in engine-driven gear pump with necessary relief valves and pressure regulators. A full flow strainer, and a full flow type lubricating oil filter shall be provided. The engine shall be of the wet sump type with all oil stored in the engine crankcase sump without the necessity of an auxiliary tank. All lubricating oil piping shall be completely installed on the unit. An oil-pressure-operator safety shut-off shall be provided to shut off the engine when the oil pressure is too low for safe operation. A device shall be provided to cut out the oil pressure shut-off when the engine is being started.

d. Cooling System. - The cooling system for the engine shall consist of a radiator, engine-driven fan together with centrifugal jacket water pump or pumps. The radiator shall be mounted on the engine structural base directly in front of the engine. The radiator fan shall be driven by V-belt and shall be capable of drawing the air through the intake louver, motorized damper and filter, across the engine and discharge forward through the radiator. Protection for the operators and the cooling cores shall be provided by a metal fan guard, constructed in two pieces and bolted to the fan ring. Automatic temperature regulator shall be provided and installed for the control of the jacket water and the lubricating oil temperatures. The temperature regulator shall be of the type which will maintain full water flow through the engine and full oil flow through the engine. The radiator and fan shall

be of proper capacity to adequately cool the engine with an entering air temperature of 100° F. Entire engine cooling system shall be filled with an aqueous solution of ethylene glycol which shall protect the engine and radiator system against freezing at a temperature of minus 20°F. All water and lubricating oil piping shall be installed complete. A water temperature operated shut-off which will shut off the engine when the cooling water exceeds the safe setting shall be provided and installed on the engine. The limit shut-off shall have an adjustable range of approximately 140°F. to 200°F.

e. Air Exhaust for Radiator. - (1) General. - Air exhaust for radiator shall be as shown on the drawings.

(2) Ductwork. - Sheet metal work indicated on the drawings shall be erected in a first-class and workmanlike manner and shall be approved by the Contracting Officer. The ducts shall be sized to fit the louvered wall opening as shown on the drawings and the diesel engine radiator flanged connection. The ducts shall be straight and smooth on the inside, with neatly finished joints. The ducts shall be properly supported from the floor in an approved manner so as to be completely free from vibration under engine operating conditions. The ducts shall be properly braced and reinforced with steel angles or other structural members spaced uniformly. The sheet metal used shall be galvanized iron or steel of 16-gage minimum thickness. Motor operated louvers shall be furnished and installed as specified in Section 16, and shall be controlled by the automatic starting equipment.

(3) Flexible Connections. - A flexible connection shall be provided between the engine radiator and the duct. It shall be made of asbestos or glass fabric, of proper weight and strength for the service, and shall be fitted to be relatively airtight.

f. Automatic Starting Equipment. - The engine shall be arranged for automatic electric starting, and the contractor shall furnish and install all necessary equipment including:

(1) Automatic Starting. - The diesel generator unit shall be equipped with automatic starting and safety shutdown controls which will start the engine automatically by interrupted cranking cycles upon loss of normal power supply. The automatic starting control shall be actuated by a relay in the automatic transfer switch. The cranking cycle shall consist of five cranks with four rest periods between cranks. Crank and rest periods shall be individually adjustable to meet any starting requirements. If the engine fails to start after the cranking cycle has been completed, the control will lock out to discontinue cranking and actuate the "over-crank" signal light on the panel. The control shall also shut down the engine in the event of low oil

pressure, high water temperature and overspeed, and indicate the cause of failure by means of an individual signal light on the panel. There shall also be included on the panel a red pilot light which burns if the control switch is placed in the "Off" position.

(2) Starter. - A 24-volt minimum heavy-duty electric cranking motor shall be provided for starting the engine. The cranking motor shall be controlled by a magnetic switch with a 24v dc coil. The cranking motor shall be capable of cranking the engine at sufficient speed to insure starting.

(3) Battery. - A 24-volt minimum battery shall be provided. The battery shall have sufficient capacity to provide a 3-minute continuous cranking of the complete unit under operating conditions with an ambient room temperature of 32°F. The battery shall have a special plate construction for severe or unusual conditions. Minimum rating shall be 200 ampere hours. The battery shall conform to the specifications for United States Government award by the Treasury Department, Procurement Division, Branch of Supply, for lead-acid storage batteries, Item 17, B8630a-2. A suitable shelf or platform with an acid-proof rubber or lead tray shall be provided and located adjacent to the engine base for mounting the battery. A hydrometer syringe and thermometer shall be included.

g. Governor. - The governor shall be of a type capable of maintaining a constant engine speed under fluctuating load conditions. The difference in speed between full load and 3/4 load shall be not greater than 3 percent of the rated operating speed of 1800 r.p.m. Maximum change in speed, when full load is applied instantaneously, shall not exceed 5 percent of the rated operating speed of 1800 r.p.m. Governor regulating devices shall be so designed that adjustments may be made easily and accurately.

h. Overspeed Stop. - The engine shall be equipped with an overspeed stop which will automatically shut off the fuel in case the engine operates in excess of the rated speed. This overspeed stop shall be separate from regular governor mechanism.

i. Engine Control Panel. - A metal engine control panel shall be provided and installed on the side of the engine as shown on the drawings. The following instruments and equipment shall be mounted on the panel as shown on drawing.

Ammeter

Tachometer

Lubricating-oil pressure gage

Hour-meter

Engine water temperature gage

Run and stop* control

Automatic starting equipment

*Stop button shall have lockout feature to prevent starting engine from remote push button.

j. Flexible Coupling. - A flexible coupling shall be provided between the engine and generator capable of transmitting 300 percent of the normal operating torque of the engine. A guard shall be provided around the coupling.

k. Exhaust Piping. - The exhaust piping shall be provided and installed as indicated on the drawings. The flexible exhaust connection to the engine exhaust manifold shall be seamless, constructed of corrosion resisting metal conforming to the requirements of Federal Specification QQ-S-766c, Class 321, 347 or 348, and shall be similar and equal to that manufactured by Atlantic Metal Hose Co., Inc., New York. The piping shall be standard weight, genuine black wrought iron pipe with flanged cast iron fittings, except as otherwise indicated on the drawings. The silencer shall be similar and approved equal to Model M-30 as manufactured by the Maxim Silencer Co. The silencer shall be equipped with removable bronze drain plugs.

l. Insulation. - The entire exhuast assembly within the buildings including the flexible connection, shall be insulated with two one-inch thicknesses of insulation conforming to Federal Specification HH-I-523a, "(Insulation Block, Pipe Covering, and Cement, Thermal, Calcium Silicate) (For Temperatures up to 1200°F.)". The insulation shall be installed with staggered joints and with an 8-ounce canvas jacket.

23-04. GENERATOR. - a. General. - The generator shall be of the standard rotating field, synchronous type having the rating specified in Paragraph 23-02a. When the generator is operating continuously at full-rated load and voltage, the temperature rise in the cores and windings shall not exceed 50° C. with Class A insulation or 70° C. with Class B insulation above an ambient temperature of 40° C. The generator shall conform to the standards of the American Institute of Electrical Engineers and the National Electrical Manufacturer's Association. It shall be a regularly manufactured type and model of a make that has been regularly manufactured for at least 5 years. Generator and exciter shall be of open dripprooof type construction. Winding insulation for both shall be Class A or Class B. The armature terminals shall be located as shown on the drawings, and shall be housed in a terminal box with a removable cover, to which conduit may be readily connected from below.

b. Bearings. - The generator shall be provided with two sleeve- or ball-bearings of ample size. The bearings shall be phosphor bronze or bronze extending into an oil reservoir.

c. Slip Rings. - Slip rings shall be of bronze or brass. Brush holders shall be of rugged construction, marine type, and shall be capable of adjustment and of being locked in position.

23-05. EXCITER. - The exciter shall be mounted on an extension of the generator and bracket, and shall be direct-connected to the generator. The exciter shall be shunt-wound and of sufficient capacity to afford proper excitation of the generator field coils at 110 percent of the generator rating. The terminal voltage shall be 62-1/2 or 125 volts d.c. A rehostat shall be furnished for the exciter field and shall be of the rotary type, suitable for mounting on the back of the power switchboard, with the controls extending through to the front of the switchboard. A field discharge resistor of proper size shall be furnished for mounting on the switchboard.

23-06. FUEL OIL STORAGE TANK AND PIPING. - a. Piping. - A fuel-oil storage tank together with fill and vent pipe and supply piping, shall be provided and shall be of the size shown on the drawings. The fuel tank shall be welded-steel construction of not less than 3/16-inch steel and shall bear the label of the Underwriters' Laboratories, or a certificate from a nationally recognized testing laboratory that the tank has been tested and conforms to the applicable standards of the Underwriters' Laboratories will be acceptable. The fuel-oil piping between fuel-oil storage and the day tank and diesel engine, shall be copper tubing conforming to Federal Specification WW-T-799a, "Tubing, Copper, Seamless (For Use with Solder-Joint or Flared-Tube Fittings)", Type K, soft, installed with flared fittings. Connections at the engine shall be made with flexible base connections. The fill and vent pipes shall be galvanized steel pipe. A lock fill cap shall be provided with watertight fill box for the tank, shall be installed where shown on the drawings. The fuel gage and painting of the tank shall conform to the requirements of Paragraph 36-07d.

b. Fuel Oil Starting Tank. - Provide an install a fuel oil starting tank of capacity indicated on the drawings. Bracket to wall adjacent to fuel oil pumps. Tanks shall be tested to 5 p.s.i. with outlets suitably plugged.

c. Fuel Oil Transfer Pump. - Provide and electrical fuel oil transfer pump of a capacity shown on the drawings. Pump shall be self-priming, positive displacement, internal gear rotary type with mechanical seal with built-in by-pass relief valve, and shall be suitable for taking suction from the fuel oil storage tank. Pump shall be direct-driven or close-coupled to driving motor and all rotating external members shall

be adequately guarded to prevent injury to operating personnel. Pump shall be controlled by the automatic starting equipment.

d. Hand-Operated Fuel Pump. - Provide and install a hand-operated fuel pump of internal gear type having a capacity as shown on the drawings. Pump shall be suitable for taking suction from the fuel oil storage tank and shall be self-priming and free from air binding when handling No. 2 Diesel fuel oil. Pump shall be bracketed to wall in a position of easy access and to permit uninterrupted and unobstructed operation.

e. Flow Indicator. - Indicator shall be of the double port type with removable screwed caps and glass port windows and shall be made of brass or bronze with inside threaded ends.

23-07. INSTALLATION. - All work shall be neatly and accurately done and shall be in accordance with the highest standards of practice for equipment of the type to be furnished, and the National Board of Fire Underwriters' Pamphlets Nos. 31 and 37. The engine and generator shall be accurately alined on the bed plate and securely attached thereto. Lifting eyes shall be provided for lifting the engine and generator, each separately, and the entire unit complete. The set shall be erected accurately to line and level, thoroughly secured, and every detail of the work of installation shall be done in a thorough, workmanlike manner. A heavy wood frame template shall be provided to guarantee proper location of anchor bolts. All bolts shall be set in pipe sleeves to permit lateral movement. Vibration dampers shall be provided under the engine supports to minimize the transmissions of vibrations to surrounding structures.

23-08. PAINTING. - The engine-generator set shall be painted in the shop in the most thorough manner to prevent corrosion, and in accordance with the manufacturer's standard practice. The engine-generator set shall be given a shop coat of machinery enamel, color as directed. Field painting of engine-generator set, storage tank, etc., shall be as specified in Section, PAINTING.

23-09. FIELD TESTS. - Following complete installation, the standby unit shall be field tested by the contractor and in the presence of the Contracting Officer as follows:

a. The unit shall be operated for 1/2 hour at rated speed and voltage at no load, during which test period the unit and auxiliary equipment shall be observed for vibration, checked for heating of bearings and electrical equipment, etc., and general performance.

b. After any required adjustments have been made, the engine generator units shall be tested as follows with readings taken once each 15 minutes. The field test shall consist of continuous operation as follows:

1 hour at 1/2 rated capacity immediately followed by
1 hour at 3/4 rated capacity immediately followed by
2 hours at full rated capacity immediately followed by
2 hours at 110 percent rated capacity.

The test data which shall be recorded during the field test shall include the following:

1. Time
2. Load in kw
3. Ambient temperature
4. Temperature of jacket water leaving engine
5. Lubricating oil pressure
6. Scavenging air or supercharger discharge pressure (where applicable)
7. A. C. volts
8. A. C. amperes
9. Power factor
10. Frequency

c. Proper correction of any defective equipment or improper installation shall be made and the entire test or any portion of it, as determined by the Contracting Officer, shall be repeated and satisfactorily completed.

d. During the field tests, the engine shall operate smoothly without objectionable noise or vibration; the governor shall maintain an even speed at all loads; and the electrical equipment shall operate with a constant steady voltage at all loads without any indication of excessive heating.

e. The valves on the engine cooling system shall be properly adjusted and permanently set.

f. The contractor shall furnish all instruments, test equipment, electrical load and personnel that are required for the tests.

23-10. GUARANTY. - The engine-generator unit furnished under these specifications shall be guaranteed in accordance with the guarantee provisions of the SPECIAL CONDITIONS.

23-11. PAYMENT. - a. Payment for designing, furnishing and installing and testing the diesel engine generator set for the Flood Control

Gate Shaft complete as specified, will be made at the contract price for Item 81, "Diesel-Electric Generator Set", which price shall include the fuel storage tank piping, sleeves, exhaust piping and all accessories.

b. Partial payment of 50 percent of the contract price will be made when the equipment has been shop tested to the complete satisfaction of the Contracting Officer and delivered complete at the site of the work.

c. Final payment will be made after the field tests are completed to the satisfaction of the Contracting Officer in accordance with Paragraph 23-09.

SECTION 24

VENTILATING SYSTEM, MECHANICAL
(INDEX)

Paragraph No.	Paragraph Title	Page No.
24-01	Scope	24-1
24-02	Applicable Specifications	24-1
	a. Federal Specifications	24-1
	b. National Association of Fan Manufacturers, Inc., Publication	24-1
	c. National Board of Fire Underwriters Pamphlets	24-1
24-03	General	24-1
	a. Standard Products	24-2
	b. Material and Equipment Schedule	24-2
24-04	Materials and Equipment	24-2
	a. Aluminum Sheets	24-2
	b. Asphalt Varnish	24-2
	c. Electrical Materials and Appliances	24-2
	d. Iron and Steel Sheets	24-2
	e. Mechanical Equipment	24-2
	f. Wire Screening	24-2
24-05	Workmanship	24-2
24-06	Fans	24-3
	a. Kitchen Fan	24-3
	b. Centrifugal Type	24-3
24-07	Vibration Absorbing Foundations	24-3
24-08	Goosenecks and Rain Hoods	24-4
24-09	Screens	24-4
24-10	Ductwork	24-4
24-11	Registers	24-5
24-12	Filters	24-5

Paragraph No.	Paragraph Title	Page No.
24-13	Dampers	24-5
24-14	Fan Control	24-5
24-15	Flexible Connections	24-5
24-16	Electrical Work	24-5
24-17	Painting and Finishing	24-5
24-18	Tests	24-6
24-19	Guaranty	24-6
24-20	Payment	24-6

SECTION 24

VENTILATING SYSTEM, MECHANICAL

24-01. SCOPE. - This section covers mechanical ventilating systems, complete.

24-02. APPLICABLE SPECIFICATIONS. - The following specifications and standards, of the issues listed below but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specifications. -

QQ-A-359d.	Aluminum Alloy Plate and Sheet 3003.
QQ-S-636.	Steel, Carbon (Low Carbon), Sheets and Strips.
QQ-S-775a.	Steel, Sheets, Carbon, Zinc-Coated.
RR-S-141a.	Screening, Wire, Insect.
TT-V-51a.	Varnish; Asphalt.
CCC-C-419.	Cloth, Duck, Cotton Unbleached Plied Yarns (Army and Numbered).

b. National Association of Fan Manufacturers, Inc., Bulletin. -

No. 110.	Standards, Definitions, Terms and Test Codes for Centrifugal, Axial and Propeller Fans.

c. National Board of Fire Underwriters Pamphlets. -

No. 90A.	Air Conditioning and Ventilating Systems of other than Residence Type (1955).
No. 91.	Blower and Exhaust Systems for Dust, Stock and Vapor Removal (1949).

24-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the ventilating system. The contractor shall be responsible for assuring that his proposed system can be installed as indicated on the drawings without violation of applicable codes, standards, or specification requirements. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer.

a. Standard Products. - The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer.

b. Material and Equipment Schedule. - As soon as practicable and within 30 days after date of award of contract and before commencement of installation of any materials or equipment, a complete schedule of materials and equipment proposed for installation shall be submitted in quintuplicate for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. In the event any items of materials or equipment contained in the schedule fail to comply with the specification requirements, such items may be rejected.

24-04. MATERIALS AND EQUIPMENT. - Materials and equipment shall conform to the respective specifications and other requirements specified below.

a. Aluminum Sheets. - Federal Specification QQ-A-359, quarter hard condition.

b. Asphalt Varnish. - Federal Specification TT-V-51.

c. Electrical Materials and Appliances. - ELECTRICAL WORK, INTERIOR, of these specifications.

d. Iron and Steel Sheets. - Iron and steel sheets, other than for registers and grilles, shall conform to Federal Specification QQ-S-775, Class D1. Steel sheets for registers and grilles shall conform to Federal Specification QQ-S-636, condition and finish standard with the manufacturer.

e. Mechanical Equipment. - Major items of mechanical equipment shall be of the best quality used for the purpose in commercial practice, and shall be the products of a reputable manufacturer. Each major component of the equipment shall have the manufacturer's name, address, and catalog number on a plate securely affixed in a conspicuous place. The name plate of a distributing agent only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts, located so that any person may come in close proximity thereto, shall be fully enclosed or properly guarded.

f. Wire Screening. - Federal Specification RR-S-141, Type I, II, or VII.

24-05. WORKMANSHIP. - Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

24-06. FANS. - a. Kitchen Fan. - Kitchen fan for Operator's Quarters shall be installed where shown on the drawings. The fan and motor shall be designed for ceiling mounting. The fan shall be complete with ceiling grille and wall discharge cap containing back draft damper. The motor shall be designed to suit the characteristics of the available electric service and be provided with a manual control switch, located where indicated on the drawings or where directed by the Contracting Officer. Thermal overload protection shall be provided in the starter or integral with the motor. The fan shall be rated in accordance with Bulletin No. 110 of the National Association of Fan Manufacturers, Inc. The fan shall have a capacity not less than that shown on the drawings.

b. Centrifugal Type. - Centrifugal type fan units, complete with motors, drive equipment, and vibration isolation supports, shall be installed where shown on the drawings. The fans shall have air capacities not less than those shown on the drawings when operating against the static pressures indicated, and shall be rated and constructed in accordance with Bulletin No. 110 of the National Association of Fan Manufacturers, Inc. The impeller wheels shall be of the multi-blade type, with curved blades, shall be heavily and rigidly constructed, accurately balanced both statically and dynamically, and free from objectionable vibration or noise. The bearings shall be self-alining and self-oiling, with adequate oil reservoirs. The fan shafts shall be of steel, and shall be provided with key seats and keys for the impeller hubs and fan pulleys. Each fan outlet shall be of ample proportions and shall be equipped with removable angles and bolts for attaching canvas or other flexible connections. Fans with wheel diameters of 12 inches or less shall be directly connected to the driving motor, and fans of larger wheel diameter shall be indirectly connected by means of an approved multiple V belt drive designed for at least 50 percent overload capacity. Where indirect drives are employed, motors shall be equipped with adjustable bases or with rails. Each motor shall be designed to suit the characteristics of the available electric service, and shall be provided with a starter, a remote control station, and a pilot indicating light, located where indicated on the drawings or where directed by the Contracting Officer. Thermal overload protection shall be provided in the starter or integral with the motor. Fans shall be so located and arranged as to afford ready access for repairs, cleaning, inspection, and lubrication. Where indicated on the drawings, fan shall be of non-sparking construction.

24-07. VIBRATION ABSORBING FOUNDATIONS. - Vibration absorbing foundations shall isolate the centrifugal-type fan units from the building structure. Each foundation shall consist of an adequate number of standard isolation units, each consisting of machine and floor fastenings, together with intermediate isolation material. The units shall be standard catalog products with printed loading ratings.

24-08. GOOSENECKS AND RAIN HOODS. - Goosenecks and rain hoods shall be constructed of galvanized iron or steel sheets of approved weight, and shall be rigidly reinforced and braced, and flashed in an approved manner.

24-09. SCREENS. - Removable bird and insect screens shall be installed in the fresh air inlet to fallout shelter and in the goosenecks and rain hoods. Insect screens shall be 16-mesh wire screening, and bird screens shall be 1/2-inch mesh galvanized hardware cloth.

24-10. DUCTWORK. - Ductwork shown on the drawings, specified, or required for the mechanical ventilation systems shall be constructed and erected in a first class workmanlike manner. The ductwork shall be constructed of galvanized iron or steel sheets or of aluminum sheets. Ducts, unless otherwise approved, shall conform accurately to the dimensions indicated on the drawings, and shall be straight and smooth on the inside, with joints neatly finished. Ducts shall be anchored securely to the building in an approved manner and shall be installed so as to be completely free from vibration under all conditions of operation. Curved elbows shall have a centerline radius not less than 1-1/2-times the width of the duct. Air turns shall be installed in abrupt elbow. The air turns shall consist of curved metal blades or vanes, arranged so as to permit the air to make the abrupt turns without appreciable turbulence, shall be the manufacturer's standard products, and shall be quiet and free from vibration when the system is in operation. Sheet metal ducts shall be properly braced and reinforced with galvanized steel angles or other approved structural members. Unless otherwise required, the internal ends of slip joints shall be installed in the direction of flow. Unless otherwise specified, the sheet metal ducts and stiffeners shall conform to Table I. Sheet metal work required in connection with kitchen system shall conform to the National Board of Fire Underwriters' Pamphlet No. 91.

Table I. Sheet-metal thickness for rectangular duct construction

Aluminum thickness (inch)	Galv. Sheet gage	Maximum size (inches)	Type of transverse joint connections	Bracing
0.20	26	Up to 12	S, drive, pocket, or bar slips on 7-ft., 10-in. centers	None
		13 to 24	S, drive, pocket, or bar slips on 7-ft., 10-in. centers.	None
0.025	24	25 to 30	S, drive, 1-in pocket or 1-in. bar slips on 7-ft., 10-in. centers.	1 x 1 x 1/8 angles 4 ft. from joint.

24-11. REGISTERS. - Registers shall be the four-way directional control type with face-operated opposed-blade volume-control damper. Registers shall have flanged face and shall be provided with sponge-rubber gasket between flange and duct. The four-way control shall be by adjustment of the horizontal and vertical vanes.

24-12. FILTERS. - Filters for the air supply system to the fallout shelter room shall be panel-type renewable media and shall have 2-inch thick glass-fiber, cellulose-fiber, cotton-linter, or synthetic fiber media pad enclosed in sectional frames of not less than 16-gage galvanized steel and equipped with quick-opening mechanism for changing filter media. The media shall have an efficiency of not less than 70 percent when tested in accordance with the Dust Spot Test Method using Cattrell precipitate as developed by the National Bureau of Standards.

24-13. DAMPERS. - The fresh air and return air dampers for the supply air system to the fallout shelter room shall be of the motorized multilouver parallel-blade type. The dampers shall be factory fabricated with galvanized blade, oil-impregnated bearings, and channel-iron frames with rust-inhibitor treatment, and shall be suitable for mounting in ductwork. Damper blades shall be not lighter than 16-gage (0.0653 inch in nominal thickness) steel and shall have interlocking edges. Dampers shall be of the two-position type.

24-14. FAN CONTROL. - The supply fan for the fallout shelter room shall be controlled by a three-position switch. With the switch placed in the first position the fan shall be deenergized, the fresh air damper shall be closed, and the return air damper shall be wide open. With the switch in its second position the fan shall be energized, the fresh air damper shall be closed, and the return air damper shall be wide open. Placing the switch in its third position shall energize the fan, open the fresh air damper, and close the return air damper.

24-15. FLEXIBLE CONNECTIONS. - Flexible connections for preventing the transmission of vibration through the ducts, shall be installed between suction and discharge openings in centrifugal fan housings and the ducts with which they are connected. The material used shall be glass, asbestos, or other approved fire resistant fabric. The flexible material shall be furnished with all necessary angles, bolts, clips, or other fastenings for securing it to the fans or adjoining ducts.

24-16. ELECTRICAL WORK. - All manual or automatic control and protective or signal devices required for the operation of the equipment herein specified and any wiring required but not indicated on the electrical plans shall be furnished and installed under this section of the specifications. Wiring shall conform to ELECTRICAL WORK, INTERIOR.

24-17. PAINTING AND FINISHING. - Duct hangers and other exposed and unprotected ferrous metal external to finished rooms shall be thoroughly cleaned and given one coat of asphalt varnish. Fan housing

external to finished rooms shall be thoroughly cleaned and given two coats of machinery enamel in a color selected by the Contracting Officer. The painting of fan units, roof ventilators, grilles, registers, and ferrous metal work exposed within finished rooms, is covered under PAINTING. Except where provided with a protective primer at the factory, all ferrous metal specified to receive finish painting shall be primed as specified in PAINTING.

24-18. TESTS. - Upon completion, and prior to acceptance of the installation, the contractor shall subject each ventilating fan to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of not less than 6 hours for each system, and all tests shall be conducted at such times as the Contracting Officer may direct. All instruments, facilities, and labor required to properly conduct the tests shall be provided by the contractor at no additional cost to the Government, and all electricity required will be furnished by the Government.

24-19. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions set forth in the SPECIAL CONDITIONS.

Damper motors
Kitchen fans
Centrifugal type fans
Controls

24-20. PAYMENT. - a. No separate payment will be made for the work covered under this section in connection with the Utility Building and the Operator's Quarters, and all costs in connection therewith shall be included in the applicable lump sum contract prices for the structures to which the work pertains.

b. No separate payment will be made for the work under this section in connection with the Flood Control Operating Tower and all costs in connection therewith shall be included in the contract lump sum price for Item 78, "Heating and Ventilating Systems - Flood Control Operating House".

SECTION 25

ELECTRICAL WORK, INTERIOR

INDEX

Paragraph No.	Paragraph Title	Page No.
25-01	Scope	25-1
25-02	General	25-1
	a. Standard Products	25-1
	b. Materials and Equipment Schedules	25-1
25-03	Standard Rules and Specifications	25-2
25-04	Grounding	25-2
	a. Water Supply Tower and Flood Control Gate Shaft	25-2
	b. Operator's Quarters and Utility Building	25-3
	c. Lightning Protection System	25-3
25-05	Wiring	25-3
25-06	Insulated Wire and Cable	25-3
	a. General	25-3
	b. Materials, Construction, and Tests	25-4
	c. Conductors	25-4
	d. Insulation	25-4
	e. Jackets	25-5
	f. Dimensional Tolerances	25-5
	g. Approval	25-5
	h. Inspection and Tests	25-5
	i. Mineral-Insulated Cable System	25-5
	j. Interior Wiring	25-6
	k. Lighting Fixture Wire	25-6
25-07	Conduit Systems	25-6
	a. Water Supply Tower and Flood Control Gate Shaft	25-6
	b. Utility Building and Operator's Quarters	25-6
	c. Installation	25-6
25-08	Non-Metallic Sheathed Cables	25-7
25-09	Outlets	25-7

Paragraph No.	Paragraph Title	Page No.
	a. Pull Boxes	25-8
	b. Clock outlets	25-8
	c. Telephone Outlets	25-8
	d. Device Plates	25-8
25-10	Wall Receptacles	25-9
	a. Duplex Convenience Receptacles	25-9
	b. Range Receptacles	25-9
	c. Power Receptacles	25-9
	d. Floodlight Receptacles	25-9
25-11	Wall Switches	25-9
25-12	Multibreaker Load Center	25-10
25-13	Panelboards	25-10
25-14	Cabinets	25-10
	a. Panelboard Cabinets	25-10
25-15	Fixtures	25-10
	a. Floodlights	25-10
	b. Type "L" Fixtures	25-11
25-16	Service Equipment and Disconnected Devices	25-11
	a. Circuit Breakers	25-11
	b. Safety Switches	25-11
25-17	Fuses	25-11
	a. Plug Fuses	25-11
	b. Cartridge Fuses, Dual Element Time Lag Type	25-12
25-18	Lighting Transformers	25-12
	a. Type and Rating	25-12
	b. Construction	25-12
	c. Full Capacity Taps	25-12
	d. Approval Data	25-12
25-19	Control Center	25-12
	a. General	25-12
	b. Construction	25-12
	c. Buses	25-13
	d. Space Heaters	25-13
	e. Fused Switches	25-14
	f. Motor Starters	25-14
	g. Transfer Switch	25-14

Paragraph No.	Paragraph Title	Page No.
	h. Wiring	25-15
	i. Name Plates	25-15
	j. Indicating Instruments	25-15
	k. Rectifier	25-16
	l. Generator Voltage Regulator	25-16
	m. Rubber Matting	25-16
	n. Painting	25-17
	o. Factory Assembly and Tests	25-17
25-20	Door Bell System	25-17
25-21	Nameplates	25-18
25-22	Motors	25-18
	a. Fractional-Horsepower Motors	25-18
	b. Integral-Horsepower Motors	25-18
25-23	Motor Control	25-18
25-24	Motor Disconnect Means	25-19
25-25	Equipment Connections	25-19
25-26	Tests	25-19
25-27	Guarantee	25-20
25-08	Payment	25-20

SECTION 25

ELECTRICAL WORK: INTERIOR

25-01. SCOPE. - This section covers the interior electrical systems, complete.

25-02. GENERAL. - The installations shall comply with the applicable rules and specifications listed below except where otherwise noted on the drawings or specified herein. All electrical materials shall be new and as approved by the Underwriters' Laboratories, Inc., or equivalent statement, except as otherwise specified herein. Defective equipment or equipment damaged in the course of installation or test shall be replaced or repaired in an approved manner. Lamps shall be furnished and installed by the contractor. The drawings indicate the extent and general arrangement of the conduit and wiring systems. If any departures from the drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted for approval as soon as practicable, and within 30 calendar days after date of receipt by him of notice to proceed. No such ddepartures shall be made without prior written approval. See Dwg. No. 40-06-04, sheet 1 attached at end of this section, relative to electrical symbols.

a. Standard Products. - Except as herein specified, the materials to be furnished under this specification shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

b. Materials and Equipment Schedules. - (1) As soon as practicable and within 120 calendar days after the date of receipt by him of notice to proceed before any materials, fixtures, or equipment are purchased, the contractor shall submit for approval a complete list, in six copies, of materials, fixtures, and equipment to be incorporated in the work. The list shall include catalog numbers, cuts, diagrams, drawings, and such other descriptive data as may be required. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on manufacturers' published ratings. Any materials, fixtures and equipment listed which are not in accordance with the specification requirements may be rejected.

(2) The contractor shall submit, within 120 calendar days of date of receipt by him of notice to proceed, detailed dimensioned drawings and data descriptive of all equipment powered by electric motors, switchboard and all its equipment, controls, lighting distribution panelboards, lighting fixtures, conduits, wire and accessories which he proposes to install and dimensioned conduit layouts of floor slabs for approval. No floor with embedded conduits shall be placed until

the contractor has received approval of this conduit layout from the Contracting Officer. The contractor will be held responsible for any delay in the placing of the floors with embedded conduits, should he fail to submit equipment data and required drawing within the time specified above.

25-03. STANDARD RULES AND SPECIFICATIONS. - a. Unless otherwise specified, all electrical equipment and materials, workmanship and tests shall conform with the current standard rules, regulations and specifications of the following authorities.

(1) American Institute of Electrical Engineers, 33 W. 39th Street, New York, New York.

(2) National Board of Fire Underwriters, National Electrical Code, 85 John Street, New York, N.Y.

(3) National Electrical Safety Code.

(4) National Electrical Manufacturers Association, 155 East 44th Street, New York, N.Y.

(5) Federal Specifications cited herein, (Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.)

b. Copies of these rules, regulations and specifications may be procured at the addresses as given, or may be seen at the Corps of Engineers Office, Waltham, Mass.

c. Options of the Government. - If the contractor fails to submit for approval, within the specified time, a list of materials, and fixtures and equipment in accordance with the preceding paragraphs, the Contracting Officer will select a complete list of materials, fixtures and equipment. The selection made by the Contracting Officer shall be final and binding and the items shall be furnished by the contractor without change in contract price or time of completions.

25-04. GROUNDING. - a. Water Supply Tower and Flood Control Gate Shaft. - The frame of the control center, generator, all metal cabinets enclosing electrical equipment and all conduits shall be effectively bonded and grounded as herein specified. All conduits at the control center shall be bonded together with a No. 6 copper cable, using standard grounding bushings for this purpose. The control center frame and 120/240 V neutral shall be grounded to this conduit ground system. A grounding conductor shall be installed in the conduit between the control center and the generator. Where conduits enter cabinets, switches, controllers, etc., other than those with cast iron enclosures, they shall be provided with standard grounding bushings which shall be used to effectively

ground the conduit to the metal enclosures. The use of locknuts and bushings will not be acceptable as a means of grounding conduit to enclosures.

b. Operator's Quarters and Utility Building. - The neutral conductor of the wiring systems and service entrance equipment in the Operator's Quarters and Utility Building shall be grounded to the water service with a No. 8 bare cable at a point as near as practicable to the water service entrance. Connection to water service shall be made using approved ground clamp. The ground wire shall be protected by 1/2-inch conduit.

c. Lightning Protection System. - Air terminals shall be located at the top of the Water Supply Tower and Flood Control Gate Shaft Structures as shown on the drawings, and down leads on the exterior of the structure will provide a direct connection to earth. The earth terminal shall consist of three 3/4- inch by 20-foot copper weld ground rods driven in undisturbed earth 20 feet apart in triangular formation in the river bed approximately 150 feet upstream from the structures bases. If ground rods cannot be used because of rock formation, contractor shall refer this item to Contracting Officer. Connection between structures and ground rods shall be made by 4/0 weatherproof copper conductor buried in the earth or fastened to exposed rock at 5 foot intervals by means of expansion sleeves and cable clips. The lightning protection system shall conform to the requirements of NBS handbook H-46.

25-05. WIRING. - Branch-circuit conductors shall be not smaller than No. 12 a.w.g. Conductors for signal and pilot control circuits may be No. 14 a.w.g. Conductors shall be continuous from outlet to outlet and no splices shall be made except within outlet or junction boxes; junction boxes may be utilized where required. Wire connectors with moulded insulating material or solderless pressure connectors, properly taped, shall be utilized for all splices in wiring. Soldered joints insulated with tape shall be kept to a minimum. Rubber and friction tape shall conform to the requirements of Federal Specifications HH-T-111c HH-T-101a respectively. Vinyl plastic tape will be acceptable in lieu of rubber and friction tape.

25-06. INSULATED WIRE AND CABLE. - a. General. - (1) Except for control center wiring or unless otherwise specified, all wire and cable for power, control and lighting systems shall be single conductor cables, insulated as specified below with either a heat and moisture-resisting or an ozone-resisting grade of insulation and with heavy duty oil resistant thermosetting synthetic compound (Neoprene) jackets, all conforming to the specific requirements specified below.

(2) The conductor size and circuit operating voltage for any particular application or service shall be as listed in the cable tabulation, as indicated on the drawings, or as specified under the detailed requirements for the particular item.

b. Materials, Construction, and Tests. - Materials, construction, and tests unless otherwise specified, shall conform to the applicable requirements of the IPCEA-NEMA Standards Publication No. WC 3-1959, March 1959, entitled "Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy". Parts, sections, appendices, grades and classes specified hereinafter will refer to the above IPCEA-NEMA Standard, unless otherwise stated.

c. Conductors. - Conductors shall be of tin or lead alloy coated annealed copper wire conforming to all the applicable requirements of Part 2. Conductors shall be solid or stranded as required below.

(1) Power and Lighting Circuits. - (a) Conductors. - Conductors to be insulated for 1000-volt service and below shall have Class B stranding.

(2) Control Circuits. - Conductors shall have Class B or Class C stranding and shall be not smaller than No. 12 AWG.

d. Insulation. - (1) Material. - Conductor insulation shall be suitable for conductor temperature of not less than 75°C, and, for conductors specified to be insulated for Rated Circuit Voltage of 600 volts and less, shall be either a vulcanized "Synthetic rubber Heat and Moisture Resisting" grade of insulation or an "Ozone-Resisting Natural or Synthetic Rubber" grade of insulation; and, for conductors specified to be insulated for a Rated Circuit Voltage of 601 volts and greater, shall be an "Ozone-Resisting Natural or Synthetic Rubber or Butyl Rubber" grade of insulation. The "Ozone Resisting" grade of insulating compounds shall conform to the requirements of Paragraphs 3.14 or 3.15, except that water absorption characteristics of the Ozone-Resisting Natural or Synthetic Rubber Grade of insulation (3.14) shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 4.5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 7 percent higher than the value determined at the end of the initial 24-hour period, nor more than 3 percent higher than at the end of the seventh day. The "Synthetic Rubber, Heat and Moisture Resisting" grade of insulating shall conform to the requirements of Paragraph 3.13, except that the specific inductive capacity and mechanical water absorption characteristics shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 10 percent higher than the value determined at the end of the initial 24-hour period; nor more than 3 percent higher than at the end of the seventh day.

The compound, after a 7-day immersion, shall not absorb more than .015 grams of water per square inch of surface exposed to the water.

The manufacturer, in the presence of the Contracting Officer, shall perform tests on samples of the insulation taken from the finished product to determine compliance with the specified requirements. Test procedure shall be in accordance with the applicable requirements of ASTM Standard D470-58T, entitled "Testing Rubber nand Thermoplastic Insulated Wire and Cable".

(2) Insulation Thickness. - Thickness of conductor insulation shall be not less than that shown in Part 3, Table 12, ungrounded neutral, for the respective Rated Circuit Voltages.

e. Jackets. - Over the insulated conductor there shall be applied an outer jacket of an oil-resisting thermosetting synthetic compound conforming to Part 4, paragraph 4.13.3. Except for shielded wires and cables, the jacket shall be in direct contact and adhere to the conductor insulation. If nonshielded, the jacket thickness shall be as specified in Part 4, Table 26. If shielded, the jacket thickness shall be in accordance with the requirements of Table 28 of the above reference.

f. Dimensional Tolerance. - The outside diameter of single conductor wires and cables and multiple-conductor cables shall not vary more than 10 percent and 5 percent, respectively, from the calculated outside diameter based on the thickness, including tolerance, of the component materials specified.

g. Approval. - Manufacture of the wire or cable shall not be started until all materials to be used in the fabrication of the finished wire or cable have been approved by the Contracting Officer.

h. Inspection and Tests. - (1) General. - Inspection and tests of wire and cable furnished under these specification shall be made by and at the plant of the manufacturer, and shall be witnessed by the Contracting Officer, unless waived in writing. All tests and inspections shall conform to the procedure set forth in the applicable specifications or standards referred to herein.

(2) Reports. - Six certified copies of test reports, indicating the results of tests made, shall be furnished the Contracting Officer, and no wire or cable shall be shipped until authorized by the Contracting Officer.

i. Mineral-Insulated Cable System. - Mineral-insulated cable system, type MI shall be furnished and installed in the Water Supply Tower and Flood Control Gate Shaft areas below Elev. 584, in lieu of exposed conduit wiring. MI cable shall be rated at 600V. Cables shall be fastened within 12 inches of each turn or offset and at intervals of not more than 6 feet. Cable terminations shall be carefully made in accordance with manufacturer's recommendations immediately upon stripping of sheath.

j. Interior Wiring. - Interior wiring for the Utility Building and Operator's Quarters, including the Garage, shall be non-metallic sheathed cable, containing a grounding conductor. In the heater room and other locations designated on the drawings where conduit or tubing is to be installed, the wiring shall be single conductor, copper, 600V rubber insulated and shall meet the requirements of Paragraph 25-06a or shall be code grade with neoprene jacket.

k. Lighting Fixture Wire. - Lighting fixture wire within the Water Supply Tower and Flood Control Gate Shaft including leads to equipment heaters and non-portable heating devices shall be single conductor, stranded copper, 600V silicone rubber insulated, with glass braid outer covering, as listed by Underwriters' Laboratories, Inc. Lighting fixture wire within the Garage, Utility Building, and Operator's Quarters where required shall be single conductor, stranded copper 300V type AF.

25-07. CONDUIT SYSTEMS. - a. Water Supply Tower and Flood Control Gate Shaft. - The conduit system shall be installed in accordance with the applicable provisions of the National Electrical Code. Cast metal conduit boxes for threaded conduit connection, shall be used. Rigid galvanized steel conduit conforming to Federal Specification WW-C-581c shall be used. Conduit fittings, including supports, shall be of cast or malleable iron conforming to Federal Specification W-F-406. Conduit shall be of 3/4-inch minimum size except as noted.

b. Utility Building and Operator's Quarters. - Non-metallic sheathed cable without conduit shall be used generally. At locations where conduit or tubing is to be installed, it shall be installed in accordance with the applicable provisions of the National Electrical Code. Rigid steel conduit shall be zinc coated and shall conform to requirements of Federal Specification WW-C-581c. Electrical metallic tubing shall be zinc coated and shall conform to requirements of Federal Specification WW-T-806b. Conduit fittings shall conform to the requirements of Federal Specification W-F-406. Conduit shall be of 1/2-inch minimum size.

c. Installation. - Conduits shall be concealed within the walls, ceilings and floors where possible, and shall be kept at least 6 inches from parallel runs of flues, steam pipes or hot-water pipes unless otherwise shown on the drawings. Exposed runs of conduit shall have supports spaced not more than 8 feet apart and shall be installed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical ends. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit-bending machine. Conduit which has been crushed or deformed in any way shall not be installed. Wooden

plugs inserted in masonry or concrete shall not be used as a base to secure conduit supports. Conduit shall be supported on approved types of wall brackets, ceiling trapeze, strap hangers, or pipe straps, secured by means of toggle bolts on hollow masonry units, expansion bolts in concrete or brick, machine screws on metal surfaces, and wood screws on wood construction. Threaded studs driven in with a powder charge are permitted for fastening raceways on solid masonry, steel, concrete and wood. Threaded studs welded to steel are acceptable. Nails shall not be used as the means of fastening boxes or conduits. Conduit shall be installed in such manner as to insure against trouble from the collection of trapped condensation, and all runs of conduit shall be arranged so as to be devoid of traps wherever possible. The contractor shall exercise the necessary precautions to prevent the lodgement of dirt, plaster, or trash in conduit, tubing, fittings, and boxes during the course of installation. A run of conduit which has become clogged shall be entirely freed of these accumulations or shall be replaced. Conduit shall be securely fastened to all sheet-metal outlet, junction, and pull boxes with galvanized locknuts and bushings, care being observed to see that the full number of threads project through to permit the bushing to be drawn tight against the end of conduit, after which the locknut shall be made up sufficiently tight to draw the bushing into firm electrical contact with the box. Double locknut construction shall be used. No. 14 soft drawn galvanized iron pull wire shall be installed in all telephone conduits.

25-08. NON-METALLIC SHEATHED CABLE. - Non metallic sheathed cable with a ground wire shall be installed in the Operator's Quarters and Utility building only in accordance with the applicable provisions of the National Electrical Code. Conductors shall be not less than No. 12. Non-metallic sheathed cables shall not be run exposed. For exposed work, insulated conductors in conduit or tubing shall be installed. Non-metallic sheathed cable shall be secured in place by means of properly sized cable straps or approved staples or other fittings. Supports shall be not more than 30 inches apart. Cable shall terminate with an approved type of connector at each outlet, unless the outlet embodies a means serving this purpose. Where 4 conductors are required, 2-2 conductor cables may be utilized. Conductors shall generally be installed over the tops or through ceiling joists or when this is impracticable, suitable running boards shall be provided as a supporting means. Care shall be taken at terminals or end supports to see that the insulation is not injuriously crimped or deformed. Non-metallic sheathed cable shall conform to the requirements of the Underwriters' Laboratories, Inc., Standard for Non-Metallic Sheathed Cable.

25-09. OUTLETS. - Outlets shall be installed in the locations shown on the drawings. The contractor shall study the general building plans in relation to the spaces surrounding each outlet in order that his work will avoid interference with the other work required by these specifications. When necessary, the contractor shall relocate outlets so that, when fixtures or other fittings are installed, they

will be symmetrically located according to room layout and will not interfere with other work or equipment. Only zinc coated or cadmium-plated sheet-steel boxes conforming to requirements of Federal Specification W-J-800a, of a class to satisfy the conditions for each outlet, shall be used in concealed work. Boxes shall be installed in a rigid and satisfactory manner, either by wood screws on wood, expansion shields on masonry, or machine screws on steel work. Threaded studs driven in with a powder charge are permitted for fastening boxes on solid masonry, steel, concrete and wood threaded studs welded to steel are acceptable. Fixture outlet boxes in concealed work on ceiling shall be not less than 4-inch octagonal. Fixture outlet boxes in concrete ceilings shall be of the 4-inch octagonal concrete type, set flush with the finished surface. Fixture outlet boxes, boxes on dry wall type ceiling construction shall be fitted with open covers set to come flush with the finished surface. Switch, telephone and receptacle outlet boxes shall be not less than 4 inches square for conduit or tubing, fitting with appropriate plaster covers, where necessary, to set flush with the finished surface. Device boxes suitable to accommodate nonmetallic sheathed cable shall be used for switch and receptacle outlets in the cable system. Outlets for exposed work and all outlets in the Water Supply Tower and the Flood Control Gate Shaft shall be of cast steel or alloy, fitted with appropriate covers. Cast-metal fittings shall conform to the requirements of Federal Specification W-C-586. Outlets and junction boxes less than 6" x 6" x 4" in exposed work shall be cast steel or alloy fitted with appropriate covers.

a. Pull Boxes. - Pull boxes of 6" x 6" x 4" and larger shall be constructed of code-gage galvanized sheet metal, of not less than the minimum size recommended by the National Electrical Code. Boxes shall be furnished with screw-fastened covers. Where several feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation.

b. Clock Outlets. - Each clock outlet shall consist of an outlet box, plaster cover where required, and single receptacle with brass clock-outlet plate. The receptacle shall be sufficiently recessed within the box to allow the complete insertion of a standard cap, flush with the plate. A suitable clip or support for hanging the clock shall be secured to the top of the plate.

c. Telephone Outlets. - Each telephone outlet shall be provided with 3/8-inch bushed hole in the center.

d. Device Plates. - A device plate shall be provided for each outlet to suit the device installed. All plates on unfinished walls or on fittings shall be of zinc-coated sheet metal having rounded or beveled edges. All plates on finished walls shall be stainless steel. Screws shall be of metal with countersunk heads, with finish to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted.

Plates shall be installed vertically and with an alinement tolerance of 1/16-inch. Device plates shall be one of the one-piece type, of suitable shape for the devices to be covered. The use of sectional device plates will not be permitted.

25-10. WALL RECEPTACLES. - Wall receptacles shall conform to the requirements of Federal Specification W-C-596, type and style as specified.

a. Duplex Convenience Receptacles. - Duplex convenience receptacles shall be grounding, series D type, 15 amperes, 125 volt rating.

b. Range receptacles. - Flush, molded-plastic, 50-ampere, 250-volt, 3-pole, 3-wire, range receptacles shall be series T. The receptacle shall be furnished with a flexible cord set, for connection to the electric range. The cord set shall consist of a 50-ampere, 250-volt, 3-pole, angle type, molded plastic cap with a 36-inch length of rubber-jacketed cable consisting of two No. 6 and one On. 8. a.w.g. conductors.

c. Power Receptacles. - Power receptacles shall be 600-volt, 30-ampere, 3-wire, 4-pole grounding type with matching plug.

d. Floodlight Receptacles. - Floodlight receptacles shall be 600-volt, 20-ampere, 2-wire, 2-pole weather resistant Crouse Hinds Catalog No. ARJ-13 Condulet with No. AR-227 housing, or approved equal. One No. APJ2271 or approved equal plug shall be provided for each receptacle and connected on the floodlight attachment cord.

25-11. WALL SWITCHES. - Wall switches shall be of the totally enclosed brown handle tumbler type and shall conform to the requirements of Federal Specification W-S-896. Switches shall have screw type terminals or screwless pressure type having suitable conductor release arrangement. Enclosures shall be of phenolic composition. Not more than one switch shall be installed in a single gang position of a switch box. Single-pole, three-way and four-way switches shall be of the tumbler type, rated 15 amperes at 120 volts, AC only. All switches shall be suitable for the control of tungsten-filament lamp loads up to their full rated capacity. When switches with pilot lights are indicated on the drawings, the combinations shall consist of a switch, as specified above, and a yoke-mounted candelabra-base socket rated at 75 watts, 125 volts, and fitted with a glass or plastic jewel, mounted in a 2-gang box with a 2-gang plate. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be colored green and for other purposes, red.

25-12. MULTIBREAKER LOAD CENTER. - Load center in Operator's Quarters, where noted on the drawings, shall be of the multibreaker type and shall have the number of branches of the ratings indicated on the drawings. The load center shall be enclosed in a code-gage, sheet-box with gray baked-enamel finish. The trim shall be recessed sufficiently to permit the breaker operating handles to protrude through the front for manual operation. Circuit breakers shall conform to the requirements of Federal Specification W-P-131a, Class B.

25-13. PANELBOARDS. - Panelboards shall be of the dead-front safety type. Unless otherwise indicated on the drawings, panelboards shall be provided with lugs only in the mains. Panelboards shall be provided with the size and number of single, double, or triple-pole branches as indicated on the drawings. Circuit-breaker-type panelboards shall conform to the requirements of Federal Specification W-P-131a, Class A, except that breakers shall have bolted type buss connection. Fusible-type panelboards shall conform to the requirements of Federal Specification W-P-146. Double- and triple-pole branches shall be of the hinged door type; single pole branches shall be of the tumbler-type switch-and-fuse unit. Switch-and-fuse units acting as motor circuit disconnects shall be horsepower-rated.

25-14. CABINETS. - Cabinet boxes shall be constructed of zinc-coated sheet steel and shall conform to the requirements of Underwriters' Laboratories, Inc. Standard for Cabinets and Boxes. Trims and doors shall have a suitable primer coat and finish coat of color specifically designated by the Contracting Officer.

a. Panelboard Cabinets. - Cabinets for panelboards shall be provided with not less than 4-inch wiring gutters at the sides, top and bottom. Cabinets shall be mounted so that the distance from the floor to the center of the top switch or circuit breaker will not exceed 6 feet 6 inches. Flush cabinets shall be provided with trims having adjustable trim clamps. Trims shall be fitted with hinged doors having a combination lock and latch. All locks shall be keyed alike. A directory holder with transparent plate and metal frame shall be mounted on the inside of each door. A neatly typed directory, properly identifying each circuit, shall be mounted under the plate.

25-15. FIXTURES. - The contractor shall provide all lighting fixtures as specified on the contract drawings, and as specified on the Corps of Engineers Drawing No. 40-06-04, Sheet 2, 3, 8, 9, 10, 11, 12, 18, 26, 28, 32, 33, 35, 42 and 45 attached at the end of this section. Auxiliaries for fluorescent fixtures shall comply with the requirements of Federal Specification W-B-30. Lamps shall be furnished and installed by the contractor. All fluorescent fixtures shall be provided with rapid start ballasts.

a. Floodlights. - Floodlights shall be 300-500 watt wide beam type with 16-inch diameter hinged cover. Glass shall be heat resisting type, ribbed for oval 70° x 90° spread. Unit shall be weatherproof

and dust tight, and shall have a suitable mounting bracket. Unit shall be approved by Underwriters' Laboratories, Inc.

b. Type "D" Fixtures. - Type "E" fixtures as specified on the attached sketch dated 15 July 1959 shall be furnished and installed in the Structures in the inspection areas as indicated on the drawings.

25-16. SERVICE EQUIPMENT AND DISCONNECTING DEVICES. - Main service disconnecting means shall be equipped with an external lever or handle for manual operation. Each unit shall be enclosed in a code gage, sheet steel cabinet suitable for flush or surface mounting as indicated on the drawings. Flush-mounted enclosures shall have screw-fastened covers. Surface mounted enclosures shall have hinged doors and catches. Neutral connections shall be solid throughout. Disconnection switches and circuit breakers shall be installed as shown on the drawings.

a. Circuit Breakers. - Circuit breakers shall comply with the applicable requirements of Federal Specification W-P-131a, class as required.

b. Safety Switches. - Safety switches shall be of the fusible type and shall comply with the requirements of Underwriters' Laboratories, Inc., Standard for Service Equipment.

25-17. FUSES. - The contractor shall furnish a complete set of fuses for all switches, panels, and control center as required. Time-current-tripping characteristics of fuses serving motors or connected in series with circuit breakers shall be coordinated for the proper operation. Fuses shall have a voltage rating not less than the circuit voltage.

a. Plug Fuses. - Plug fuses shall be the nonrenewable time-delay type, and shall be used for circuits rated 125 volts or less and 30 amperes or less, conforming to the requirements of Federal Specification W-F-791, type II, style B.

b. Cartridge Fuses, Dual-Element Time-Lag Type. - Cartridge fuses, dual-element time-lag type, shall be nonrenewable with an interrupting rating not less than 10,000 amperes, conforming to the requirements of Federal Specification W-F-791, type I, style A. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds. Cartridge fuses shall be used for circuits rated in excess of 30 amperes.

25-18. LIGHTING TRANSFORMERS. - a. Type and Rating. - Lighting transformers shall be furnished and installed as shown on the drawings. The transformer shall be for 60-cycle operation, shall have the phase, voltage and power rating specified on the drawings, and shall be the two-winding dry type, self-cooled. The transformers shall be designed to carry full rated load continuously without exceeding 80 degrees C. rise above an ambient temperature of 40 degrees C. when cooled by natural air circulation. While in service they shall be capable of withstanding without injury a short circuit on the secondary terminals with normal voltage maintained on the primary terminals provided the duration of this condition is at no time sufficient to cause injurious heating.

b. Construction. - Each transformer for independent mounting shall be rigidly attached to a suitable base and completely enclosed by a metal housing. Suitable removable lifting eye bolts or other approved means shall be provided for handling each transformer both with and without the housing.

c. Full Capacity Taps. - The lighting transformers shall be provided with two 5 percent full capacity taps below rated primary voltage. A terminal board and studs inside the transformer shall be provided as the means for changing the transformer tap connection made accessible by removal of a panel.

d. Approval Data. - Data to be submitted for approval before commencing manufacture shall include assembly and dimensional drawings; weights; descriptive specifications covering type, rating, taps and details of construction.

25-19. CONTROL CENTER. - a. General. - The equipment to be furnished and installed under this paragraph of the specification consists of an indoor control center unit complete with breakers, contactors, instrument transformers, push-buttons, selector switches, indicator lights and all internal wiring and external connections as specified or shown on the drawings.

b. Construction. - The structure shall incorporate the latest design features of high grade equipment complying with the applicable standards. The front outside surfaces shall not be drilled or welded for the purpose of attaching wires or mounting devices if such holes or

fastenings will be visible from the front. Each vertical control center unit shall consist of U.S. Standard minimum 12 gauge steel plates formed and braced adequately to form a rigid self-supporting structure. The arrangement of the units shall be such that adequate space and access panels are provided for wiring and for inspection and maintenance of equipment and connections. All ferrous fastenings shall have an approved rust resistant finish and all bolts and screws shall be equipped with approved locking devices. All structures shall be designed for dead front operation. Instruments shall be the front mounted, semi-flush type. All door hinges shall be of the fully concealed, loose pin or continuous type which will permit the doors to swing through not less than 105 degrees. The control center shall be so designed that units can be easily removed or future units added as required, and future space compartments shall be furnished with guide rails, separator bars and cover plates. Each unit structure shall be provided with horizontal wiring spaces at top and bottom which shall line up with adjacent units to form raceways the length of the control center. Provisions shall be made so that a compartment door cannot be opened while the respective switch is in the closed position, so that the switch can be padlocked in open or closed position, and for locking the unit in the "tilt out" or test positions. The equipment in each compartment shall be of the tilt out or drawout type with connections made to the vertical bus by stab assemblies so constructed and reinforced as to insure maintenance of adequate contact area and pressure. Stab assemblies and bus connections shall be silver plated. Control centers shall have NEMA Type "C" construction, with plug in or stab connections for NEMA size 4 controllers and smaller. Removable sub-panels shall be provided for auxiliary or control accessories. Each operating device such as a switch or a combination starter shall be assembled as a standardized unit. Suitable guides shall be provided for aligning and supporting the units during their removal or replacement. Doors shall be such that they can be closed after a switch or starter is removed from the structure. Each unit compartment shall be barriered or baffled.

c. Buses. - All buses shall be of hard drawn copper of not less than 98 percent conductivity and shall be supported amply and rigidly by insulating supports. All bus joints shall be silver plated with provision for adequate clamping. A main horizontal 600-volt, 3-phase, 200-ampere copper bus shall be provided across the top of all the control centers from which vertical 100-ampere copper buses shall distribute power to the switches and controllers. The electrical clearances of the buses, phase to phase or phase to ground, shall be not less than 1-1/2 inches. The bus shall be sufficiently braced to withstand short circuit stresses equal to 25,000 amperes. The control center shall include an interior ground bus to which all non-current carrying parts of the structure shall be grounded. The ground bus shall be of copper 1/4 inch by 1 inch and shall run lengthwise of the control center.

d. Space Heaters. - Space heaters, with a minimum rating of 150 watts, shall be provided in each vertical section of the control center.

e. Fused Switches. - (1) General. - Each shall conform to requirements of Federal Specification W-S-865, type NDS. Each device shall be of the hand-operated, type with voltage ratings appropriate to the circuit and duty indicated.

(2) Construction. - The complete fusible switch units shall be mounted and totally enclosed in strong housings to insure proper alignment and quick mounting and dismounting. Each switch shall have an operating handle linked with an external operating handle mounted on the framework door. Position indication shall be clearly visible on the front of the switchboard and shall indicate "open", and "closed", positions. Provision shall be made for padlocking each control center switch in the open position. Name plates shall be mounted on the panels or doors adjacent to the handles. All switches shall be of the same manufacture, and switches of the same size shall be interchangeable, insofar as the specifications permit. Switches shall be removable from the front without disturbing adjacent switches. Each switch shall be suitable for repetitive operation as specified by the Underwriters' Laboratories Standards without more than routine maintenance such as contact refinishing and replacement. The contacts shall be of a design that will permit the switches to carry full load continuously, without overheating.

(3) Cartridge fuses, dual-element time-lag type, shall be nonrenewable with an interrupting rating not less than 10,000 amperes. At 500 percent current, cartridge fuses shall not blow in less than 10 seconds. Cartridge shall conform to the requirements of NEMA Standard FU 1, class H, and Federal Specification W-F-791, type I, style A.

f. Motor Starters. - Motor starters shall be of the full-magnetic type, reversing or non-reversing as required. Contactors and related equipment shall conform to the standards of construction described elsewhere in this specification. Control transformers shall be provided as shown on the wiring diagrams and shall be of sufficient capacity to operate coils and related devices, such as heaters, at a minimum of 95 percent of rated voltage without exceeding the continuous current rating.

g. Transfer Switch. - An automatic transfer switch shall be provided. The transfer switch shall be 150 amperes, 600 volt, 3 phase, 3 wire, 60 cycle switch, and shall transfer the load from normal to emergency when any phase of normal drops below 70% and automatically restore load to normal when all phases are 90% or more of rated value. An auxiliary contact shall close the engine starting circuit when normal power fails. The main contacts shall be operated by a single coil mechanism, interlocked both mechanically and electtically. The transfer switch shall be enclosed in a NEMA 1 cabinet suitable for wall mounting.

A 3-seconds fixed time delay shall be provided to prevent switch from functioning in the event of momentary outage of normal power. There shall be a 2- to 30-minute adjustable delay incorporated in the switch to delay switch from returning to normal position after normal power is available. A test switch shall be provided to simulate normal power failure for testing both the transfer switch and generator set.

h. Wiring. - (1) Type. - Power wiring shall meet the requirements of paragraph 25-05 of the specification. Control wiring shall be switchboard type, tinned copper wire. Either type AVB, designation Number 6, or type TA, designation Number 8 (NEMA Standard WC1-1955) may be used. Hinge wires shall be type AVB, designation Number 7 or type TA, designation Number 9 with Class "k" stranding. Minimum wire size shall be Number 12 AWG except that current transformer leads shall be not smaller than Number 19/22.

(2) Terminals and Installation. - All control wiring within the assembly shall be furnished and installed at the factory. All control wiring leaving equipment shall be run to terminal blocks. Terminals shall be provided for connection of remote circuits to all spare auxiliary and alarm contacts, remote control switches, and remote indicating lights where such devices are specified or applicable to the equipment concerned. There shall be no splices in the wire and all connections shall be made at terminal studs or blocks with solderless lugs or turned eyes with cup washers. Terminal stud connections shall have locknuts. Approved solderless terminals and cable clamps shall be furnished for each power conductor entering or leaving the equipment. Power and control conductors shall enter the switchgear as indicated on the contract drawings. Clamp type terminals of an approved size and type shall be provided for all main power cables leaving the board.

i. Name Plates. - (1) Each component integral piece of equipment such as a circuit breaker, relay or transformer, shall be identified with sufficient information to establish the type and rating and to permit reordering.

(2) Each compartment door and operating unit shall be provided with an identifying name plate approximately one by three inches in size or as indicated on the drawings. A switchgear assembly name plate approximately three by five inches in size shall also be provided. The above name plates shall be of laminated plastic, and shall provide for engraved white lettering on a black background.

j. Indicating Instruments. - (1) General. - All indicating instruments shall be of the rectangular, semi-flush mounted, back connected, long scale switchboard type, conforming to NEMA Standard DI-1. The mounting case shall be approximately 4-1/2 inches square. The scale shall be of the 250 degree type.

(2) Accuracy of Instruments. - Accuracy of all instruments shall be within one percent of full scale. Moving elements shall be equipped with zero adjustment on the face of each instrument.

k. Rectifier. - Suitable selenium or copper oxide type rectifier and high-low charge control device for maintaining remote mounted 24 volt storage battery (included with engine generator equipment) at full charge during periods when engine is not in operation shall be provided. When engine is operating, the battery may receive charge from an auxiliary 24V DC generator. Under these conditions, the rectifier equipment shall be automatically disconnected from the battery and shall be automatically reconnected when the engine is shut down. The rectifier, control and devices may be shelf mounted within the compartment - with connections accessible through the hinged door.

l. Generator Voltage Regulator. - (1) General. - Generator voltage regulator shall be a standard manufactured product, completely automatic in its operation. It shall be designed to apply partial nor full corrective action as required by the voltage deviation from normal, and to prevent hunting of the controlled voltage, and shall be capable of forcing the generator field to its full limit and holding it at that limit indefinitely, all as approved by the Contracting Officer. The operation of the regulator shall not be affected by a variation of the frequency of the controlled voltage. The regulator shall be similar and approved equal to the General Electric Company's type GDA or the Westinghouse Electric Corporation's "Silverstat". A static type regulator meeting the performance specified herein may, with the approval of the Contracting Officer, be furnished.

(2) Sensitivity and Time of Operation. - The sensitivity of the regulator shall be such that it will detect a voltage change of 1-1/2 percent from normal operating voltage, and supply corrective action to restore the voltage to the sensitivity zone. The regulator shall apply full corrective action in 1/10 of a second for a 10 percent change in the regulated voltage.

(3) Construction. - The regulator, with all accessories, shall be suitable for mounting on the switchboard. The regulating mechanism shall be provided with a suitable enclosing case. The construction of the case shall be such as to allow ready access to the operating parts. A voltage adjusting rheostat shall be provided.

m. Rubber Matting. - The contractor shall furnish a corrugated, non-slip rubber mat of high dielectric strength and long aging qualities with each indoor control center. The mats shall be not less than 27-inches wide and shall extend along the full length of the control centers. The mat shall comply with ASTM Specifications designation D 178.

n. Painting. - All surfaces of the control centers shall be painted and, before painting, shall be thoroughly cleaned by sardblasting pickling and rinsing or by other means approved by the Contracting Officer. The cleaning process shall be followed immediately by application of a rust inhibitive wash (bonderizing or approved equal). All surfaces shall then be primed, filled where necessary, and given two coats of synthetic undercoat. The finish coat shall be a semi-gloss paint. The color of the finish coat shall be the manufacturer's standard color which nearly matches Federal Standard 595 Color No. 26440. The undercoat shall conform to the requirements of Federal Specification TT-E-543 and the semi-gloss shall conform to Federal Specification TT-E-529. The primer shall conform to Federal Specification TT-P-57 for "Paint, Zinc, Yellow-Iron Oxide Base, Ready-Mixed", Type II. One pint of the semi-gloss finish coat shall be furnished for touch-up painting after the equipment has been installed.

o. Factory Assembly and Tests. - (1) General. - All equipment shall be completely assembled at the factory and shall be designed for minimum disassembly for shipping purposes. Subdivided equipment shall be properly matchmarked to facilitate installation. Any device which cannot withstand the hazards of shipment when mounted in place shall be carefully packed and shipped separately. All parts shall be prepared for shipment so that slings for handling may be readily attached while the structures are in a railroad car. Each item of equipment supplied under this specification shall be given the manufacturer's routine factory tests and also other tests, as specified below, to insure successful operation of all parts of the assemblies. All tests required herein shall be witnessed by the Contracting Officer or his authorized representative, unless waived in writing; and no equipment shall be shipped until it has been approved for shipment by the Contracting Officer or his authorized representative. The contractor shall notify the Contracting Officer sufficiently in advance of the date of the tests so that arrangements can be made for the Contracting Officer or his authorized representative to be present at the tests. The factory test equipment and the test methods used shall conform to the applicable requirements of ASA, AIEE, and NEMA Standards, and shall be subject to the approval of the Contracting Officer or his authorized representative. The contractor shall furnish five certified copies of the reports of all tests, including complete test data. The cost of performing all tests shall be borne by the contractor and shall be included in the prices bid for the various items of equipment in the schedule.

(2) Instrument Transformers. - The potential and current transformers shall conform to NEMA Standard E1-2.

25-20. DOOR BELL SYSTEM. - The door bell system in the Operator's Quarters, with brass push buttons similar and approved equal to Edwards No. 620, shall be installed at the front and rear doors. Chimes shall be Edwards No. 1605, 2-entrance type, or approved equal, located where shown on the drawings. A bell ringing transformer for the system shall be installed in the basement.

25-21. NAMEPLATES. - Each safety switch, pushbutton station, contactor, and motor starter shall have mounted on it a nameplate. Nameplates shall have lettered on them a description of the device controlled and the current and voltage ratings of the equipment on which the nameplate is mounted. Except as otherwise specified, nameplates shall be thermosetting laminate with white letters on black background protected by melomine overlay similar to MIL-P-78A, type GCP-H, as manufactured by Duralith Corp., or approved equal. A list of all proposed nameplates shall be submitted to the Contracting Officer for approval.

25-22. MOTORS. - Motors furnished under this and other sections of these specification shall be of sufficient size for the duty to be performed and shall not exceed their full rated load when the driven equipment is operating at specified capacity under the most severe conditions likely to be encountered. The horsepower ratings indicated on electrical plans are for guidance only and do not limit the equipment size. Unless otherwise specified, all motors shall have open frames, special class A oil and moistureproof insulation, and continuous-duty classification based on a 40°C. ambient temperature of reference.

a. Fractional-Horsepower Motors. - Fractional-horsepower motors shall conform to Federal Specification CC-M-636a.

b. Integral-Horsepower Motors. - Integral-horsepower motors shall conform to Federal Specification CC-M-641b. Polyphase motors shall be class B, squirrel-cage type, having normal-starting-torque and low-starting-current characteristics, unless other characteristics are specified elsewhere.

25-23. MOTOR CONTROL. - Each motor, or group of motors requiring a single control, shall be provided under other sections of these specification with a suitable controller and devices that will perform the functions as specified for the respective motors. Controllers shall conform to the National Electrical Manufacturers Association Standard ICI and the Underwriters' Laboratories, Inc., Standard for Industrial Control Equipment. Each motor 1/8 horsepower or larger shall be provided with thermal-overload protection. The overload-protection device shall be provided either integral with the motor or controller, or mounted in a separate enclosure. Unless otherwise specified, the protective device shall be of the manually reset type. Each phase of 3-phase motors shall be protected with an overload device. Single- or double-pole tumbler switches specifically designed for alternating-current operation only may be used as manual controllers for single-phase motors having a current rating of not in excess of 80% of the switch rating. Automatic-control devices such as thermostats or float or pressure switches may control the starting and stopping of motors directly, provided they are

designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used, with the automatic-control device actuating the pilot control circuit. When combination manual-and-automatic control is specified and the automatic-control device operates the motor directly, a double-throw, three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-position selector switch marked "Manual-Off-Automatic.

25-24. MOTOR DISCONNECT MEANS. - Each motor shall be provided with a disconnecting means under this section of the specifications, when required by the National Electrical Code even though not indicated on the drawings. A circuit breaker or horsepower-rated switch in a panelboard will be acceptable as a disconnecting means, if located within the sight of the motor controller. For single-phase motors, a single- or double-pole tumbler or snap switch, rated only for alternating current, will be acceptable for capacities less than 30 amperes, provided the ampere rating of the switch is at least 125% of the rating of the controlled equipment. Switches shall be horsepower rated in accordance with Table III of Federal Specification W-S-865. Enclosed switches shall conform to Federal Specification W-S-865, type NDS. Switches shall disconnect all ungrounded conductors.

25-25. EQUIPMENT CONNECTIONS. - Connections for equipment subject to vibration shall be made with flexible conduit. Controllers for motors, disconnect switches and all control, protective, and signal devices for motor circuits, except where such apparatus is furnished mounted and connected, and left in operating condition. Connections include those between the control center and the engine control panel furnished with the engine. Size of conductors between motors and control of protective apparatus shall be as recommended by the manufacturer of the apparatus, or as required by the National Electrical Code.

25-26. TESTS. - All wiring shall be so installed that, when completed, the systems will be free from short-circuits and grounds, and the insulation resistances shall be not less than the values given in paragraph 110-19 of the National Electrical Code. After the interior-wiring-system is completed, and at such time as the Contracting Officer may direct, the contractor shall conduct an operating test for approval. The test shall include the operation of all equipment from the emergency generator set. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer or his authorized representative. The contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power. The control center will be inspected at the place of manufacture prior to shipment.

25-27. GUARANTEE. - The following equipment to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions set forth in the SPECIAL CONDITIONS.

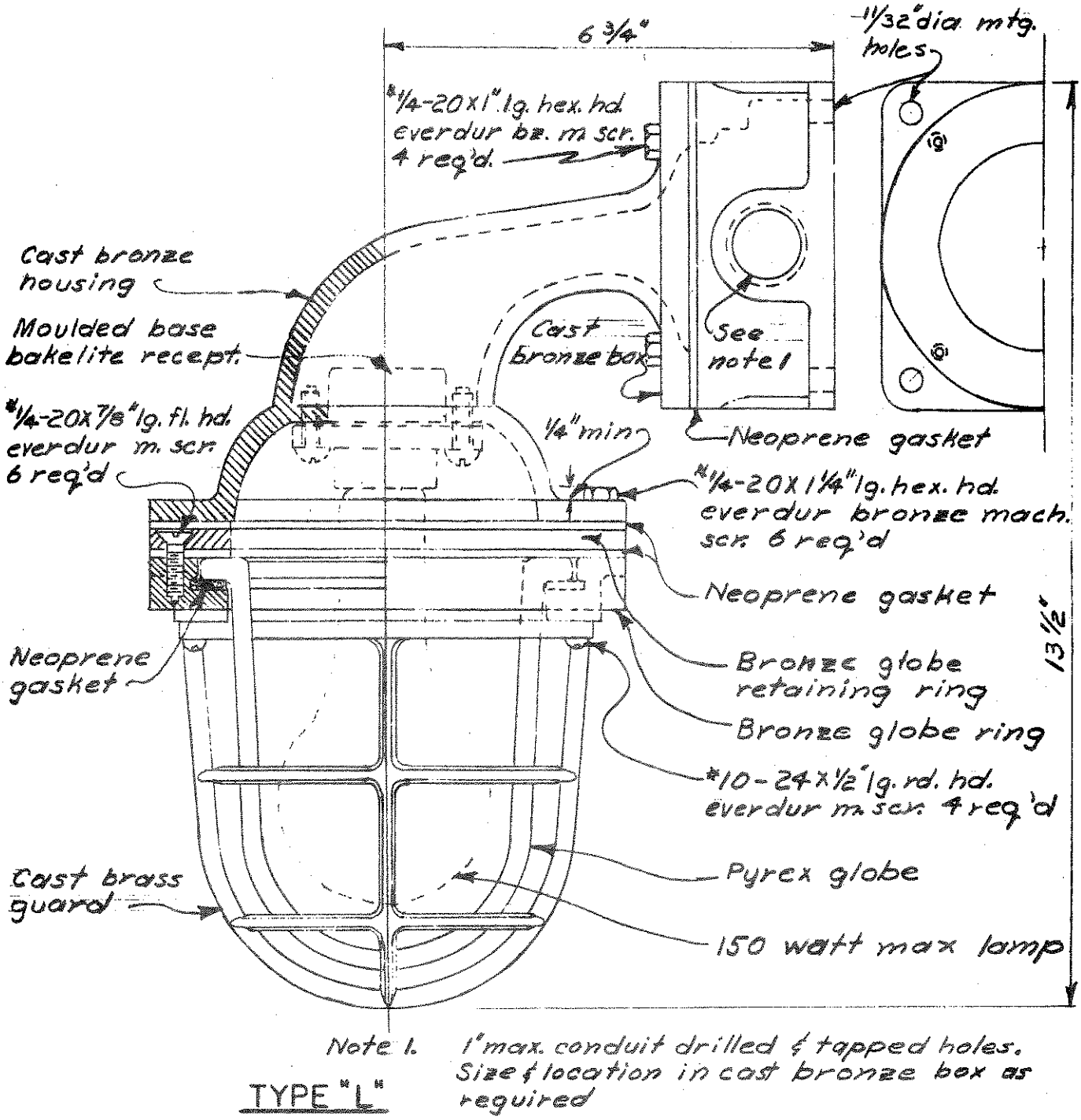
Control Center
Switches
Circuit Breakers
Panelboards
Transformers
Wire and Cable
Lighting Fixtures

25-08. PAYMENT - All electrical work performed under this section, including grounding system, will be paid for under the applicable contract prices as outlined below and shall include all costs of furnishing, installing and testing the electrical installations as shown on the drawings for the respective installations.

a. All interior electrical work for the Operator's Quarters, Utility Building, and Garage will be paid for and included under the applicable lump sum contract prices for Items 96, 97 & 98 "Utility Building", Operator's Quarters", and "Garage".

b. Payment for all interior electrical work for the Flood Control Tower and the Flood Control Gate Shaft will be included under the applicable lump sum contract prices for Items No. 82 and 86, "Electrical Work, Interior".

c. If additional lengths of ground rods are installed as directed in accordance with requirements of Paragraph 25-04a, payment will be made therefor by the pound under Item 73, "Miscellaneous Metals".



TYPE "L"

Bracket, watertight, heavy cast bronze angle body with cast brass guard, cast bronze outlet box with conduit hubs, and heavy clear globe made of borosilicate or pyrex glass and having a low coefficient of expansion (3.2×10^{-6} or less.) Assembly shall be made watertight with suitable gaskets and Everdur bronze machine screws. Provide heavy duty bakelite or porcelain lamp receptacle mounted in body with suitable gaskets. Fixture shall be watertight under 50 foot head of 3 weeks duration and shall permit continuous lighting either under or above water without damage. Fixture wire shall be 600 volt silicone rubber, N.E.C., type SFF-2.

15 JULY 1959

Revisions to Electrical Fixture Drawing No. 40-06-04

1. The following revisions will be incorporated in the specifications of the subject drawing pending revision of the sheets by the Chief of Engineers:

a. Sheet No. 3. - Add the following: "Reflector and socket shall be easily detached as a unit."

b. Sheets Nos. 5 and 7. - Add the following: "Fixture necks shall be provided with openings for ventilation."

c. Sheets Nos. 8 and 9. - Delete requirement for "threaded neck" construction; eighth line, delete "asbestos".

d. Sheet No. 10. - First line, delete "screw type"; third line, insert "bakelite or" before "porcelain"; fifth line, delete "asbestos".

e. Sheet No. 11. - First line, delete "screw type"; third line, insert "bakelite or" before "porcelain"; fifth line, delete "asbestos"; sixth line, delete the words "round or" and substitute "a".

f. Sheet No. 12. - Second line, delete "20 gauge" and substitute "22 gage"; sixth line, delete "while the inside reflecting surface of holders shall be of white enamel".

g. Sheet No. 16. - After "light proof continuous hinge" add "or concealed-type drop hinges".

h. Sheet No. 26. - Last line, insert "insulated" before "pull chain".

i. Sheet No. 43. - Delete sentences 3 to 7, inclusive, and 9 to 13, inclusive. Line 22, after "starters," insert "for preheat lamps". Add the following:

"Fixtures shall conform to Federal Specification W-L-331, type I or II, style B, class A. Reflectors shall be porcelain enameled steel. Reflectors having openings permitting an 8-15% upward component of light are acceptable. Sockets shall be of a type requiring an axial movement of the lamp for insertion and removal."

j. Sheet No. 44. - Delete sentences 3 to 6 inclusive, 8 to 11, inclusive. Line 20, after "starters," add the following:

"Fixtures shall conform to Federal Specification W-L-331, type I or II, style B, class A. Reflectors shall be porcelain enameled steel. Reflectors having openings permitting an 8-15% upward component of light are acceptable. Sockets shall be of a type requiring an axial movement of the lamp for insertion and removal."

k. Sheet No. 46. - Width of four light fixtures should be approximately 16 inches. Line 16, after "78%" insert "For two lamp fixtures and 75% for three and four lamp fixtures".

l. Sheet No. 47. - Line 12, delete "curved" and substitute "straight". Last line, add the following: "For two lamp fixtures and 75% for three and four lamp fixtures."

Rev 2/2/62

ELECTRICAL SYMBOLS

GENERAL OUTLETS

CEILING	WALL	
○	—○	Outlet.
Ⓑ	—Ⓑ	Blanked Outlet.
Ⓓ		Drop Cord.
Ⓤ	—Ⓤ	Unit Heater or Cooler
Ⓝ	—Ⓝ	Night Light
Ⓕ	—Ⓕ	Fan Outlet.
Ⓙ	—Ⓙ	Junction Box.
Ⓛ	—Ⓛ	Lamp Holder.
$Ⓛ_{PS}$	$—Ⓛ_{PS}$	Lamp Holder with Pull Switch.
Ⓢ	—Ⓢ	Pull Switch.
	—Ⓣ	Thermostat 5'-0" Up Lamp.
Ⓧ	—Ⓧ	Exit Light Outlet.
Ⓒ	—Ⓒ	Clock Outlet
		Fluorescent Fixture Outlet

SWITCH OUTLETS

S	Single Pole Switch. 4'-0" Up
S_2	Double Pole Switch.
S_3	Three Way Switch.
S_4	Four way switch
S_D	Automatic Door Switch.
S_E	Electrolier Switch.
S_K	Key Operated Switch.
S_P	Switch and Pilot Lamp.
S_{MC}	Momentary Contact Switch.
S_{RC}	Remote Control Switch.
S_{WP}	Weatherproof Switch.

CONVENIENCE OUTLETS

=⊖	Duplex Convenience Outlet. 1'-0" Up
$=⊖_{1,3}$	Convenience Outlet other than Duplex. 1=Single, 3=Triplex, etc.
$=⊖_{WP}$	Weatherproof Convenience Outlet.
$=⊖_R$	Range Outlet.
$=⊖_S$	Switch and Convenience Outlet.
=⊖R	Radio and Convenience Outlet.
Ⓐ	Special Purpose Outlet (Des. in Spec.)
⊙	Floor Outlet.
—⊛	20A. 250 V. Receptable and plug, polarized.
—◑	30A. 250 V. Receptacle and plug, polarized.

SPECIAL OUTLETS

$○_{a,b,c\text{-}etc.}$
$=⊖_{a,b,c\text{-}etc.}$
$S_{a,b,c\text{-}etc.}$

Any Standard Symbol as given above with the addition of a lower case subscript letter may be used to designate some special variation of Standard Equipment of particular interest in a specific set of architectural plans.

When used they must be listed in the Key of Symbols on each drawing and if necessary further described in the specifications.

$□_{a,b,c}$ Special Auxiliary Outlets.

Subscript letters refer to notes on plans or detailed description in specifications.

PANELS, CIRCUITS AND MISCELLANEOUS

- Lighting Panel.
- Power Panel.
- —— Branch Circuit; Concealed in Ceiling or Wall.
- – – Branch Circuit; Concealed in Floor.
- ····· Branch Circuit; Exposed.
- Home Run to Panel Board. Indicate number of Circuits by number of arrows.

  Note: Any circuit without further designation indicates a two-wire circuit. For a greater number of wires indicate as follows: ⫽ (3 wires) ⫽⫽ (4 wires), etc.
- Feeders.
- ------ Auxiliary System Circuits.
- Underfloor duct and junction box. Triple system. Note: Single and double systems indicated by one or two lines.
- Ⓖ Generator.
- Ⓜ Motor.
- Service Switch or Breaker
- Controller.
- Isolating Switch.

AUXILIARY SYSTEMS

- Push Button.
- Buzzer.
- Bell.
- Annunciator.
- Telephone 1'-0" up
- Interconnecting Telephone. 1'-0" Up
- Telephone Switchboard.
- T Bell Ringing Transformer.
- FD Fire Alarm Bell.
- F Fire Alarm Station.
- Fire Alarm Station.
- FA Fire Alarm Central Station.
- FS Automatic Fire Alarm Device.
- W Watchman's Station. 4'-6" Up
- WC Watchman's Central Station.
- H Horn.
- R Radio Outlet. 1'-0" Up
- SC Signal Central Station.
- Interconnection Box.

Note: Heights to center wall outlets unless otherwise specified or noted.

Bracket Light----------5'-8
Bracket Light over Mirror----6'-3"

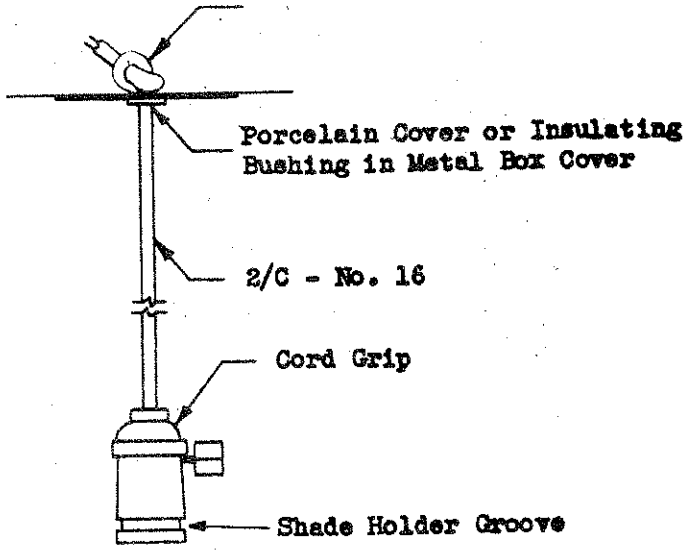
15 August 1950

Dwg. No. 40-06-04
Sheet 1

ARMY-NED-BOSTON



OUTLET BOX RECEPTACLE
Type LR



DROP CORD
Type D C

Type D C:

Drop cord to be key type medium base porcelain socket attached to two conductor No. 16 Type "SJ", "SJO" or "SJT" cord of sufficient length to suspend key of socket 6 feet 6 inches above finished floor. Cord to have suitable strain knot. Outlet box cover to have suitable insulating bushing.

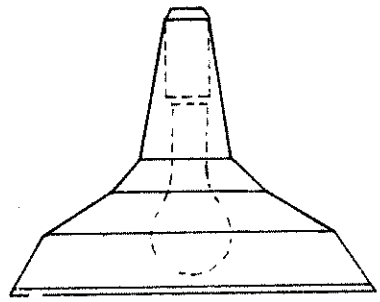
Type L R:

Outlet box keyless lamp receptacle to be of porcelain, rated not less than 660 watts, and provided with a shade-holder groove. The device shall be suitable in size for the outlet box on which it is to be mounted.

Type LRP:

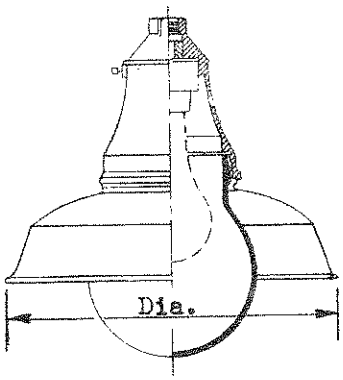
Same as Type LR except furnished with a pull switch, short length of chain, four foot length linen cord and ball. Rating, 250 watts minimum.

15 August 1950

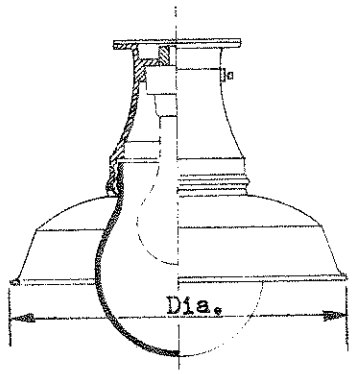


TYPE	DIAMETER	LAMP
I-1	12"	60-100 W
I-2	14"	150 W
I-3	16"	200 W
I-4	18"	300-500 W

Industrial porcelain enameled steel, dome reflector having a hood suitable for the outlet from which the fixture is supported. Socket shall be keyless unless specifically noted otherwise. Fixture shall be ceiling mounted except where noted on drawings, in which case the pendant shall be one half inch threaded conduit. Fixture shall comply with the applicable requirements of Federal Specification W-F-412.



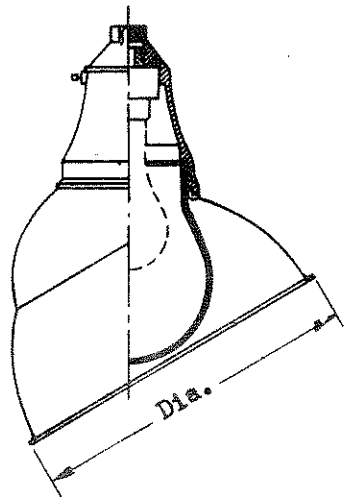
Pendant Hood Type



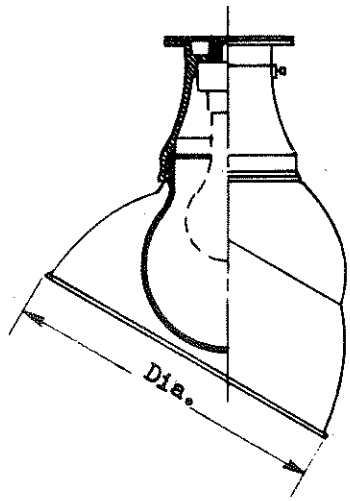
Ceiling Hood Type

Pendant Type	Lamp Watts	Diameter of Reflector	Ceiling Type
V-1	75-100	12	V-5
V-2	150	14	V-6
V-3	200	16	V-7
V-4	300-500	18	V-8

Heavy duty vaportight (vapor proof) lighting fixture with cast metal pendant or ceiling hood, heavy gauge steel, porcelain enameled dome reflector of the acid resisting, threaded neck type. Unit shall be ruggedly constructed for either weather or vapor proof applications and maintain high efficiency output. The cast metal hood shall be designed for either ½ inch conduit or 4 inch outlet box mounting designed to accommodate screw globe and reflector. Provide asbestos gasket between hood and globe, sealing gland and gaskets for reflector and wire entrance. Globe to be clear, heat-resisting glass. Provide medium or mogul base porcelain socket as required for lamp size. Fixture to be wired with two No. 14 Type "AF" conductors. Hood type to be as noted on project drawings. Ferrous parts shall have corrosion resistant finish.



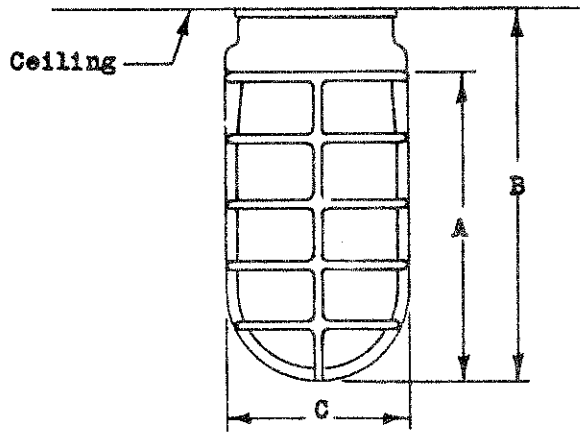
Pendant Hood Type



Ceiling Hood Type

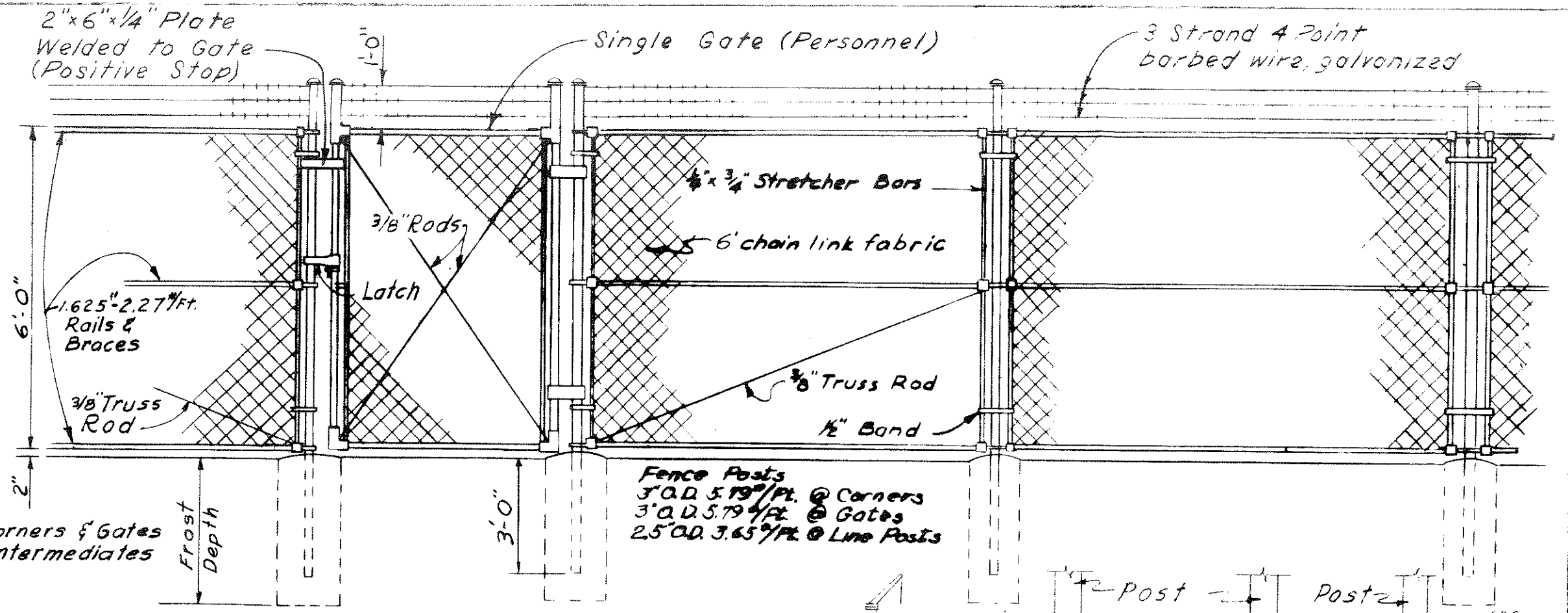
Pendant Type	Lamp Watts	Diameter of Reflector	Ceiling Type
VA-1	75-100	10	VA-4
VA-2	150-200	12	VA-5
VA-3	200-500	14	VA-6

Heavy duty vaportight (vapor proof) lighting fixture with cast metal pendant or ceiling hood, heavy gauge steel, porcelain enameled 30 degree symmetrical angle reflector of the acid resisting, threaded neck type. Unit shall be ruggedly constructed for either weather or vapor proof applications and maintain high efficiency output. The cast metal hood shall be designed for either $\frac{1}{2}$ inch conduit or 4 inch outlet box mounting designed to accommodate screw globe and reflector. Provide asbestos gasket between hood and globe, sealing gland and gaskets for reflector and wire entrance. Globe to be clear, heat-resisting glass. Provide medium or mogul base porcelain socket as required for lamp size. Fixture to be wired with two No. 14 Type "AF" conductors. Hood type to be as noted on project drawings. Ferrous parts shall have corrosion resistant finish.



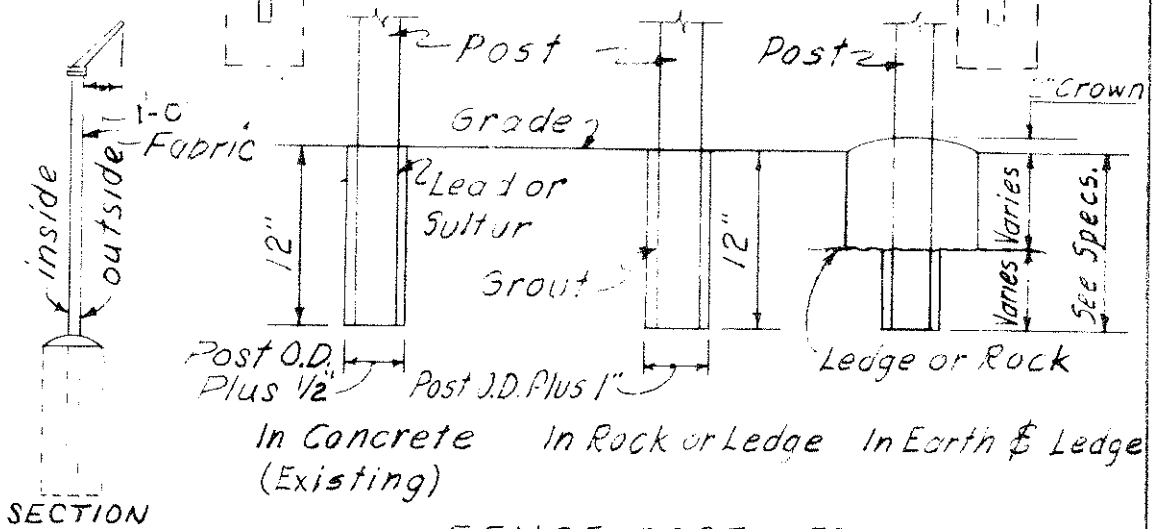
Type	Lamp Size	A	B	C
VG-1	100	6-7/8	8¼	4¼
VG-2	150-200	9-3/8	10¾	5¼

Ceiling type, heavy cast metal body with screw type cast metal guard and clear glass screw type globe. Provide screw terminal, heavy duty, porcelain lamp receptacle mounted in cast body with suitable impregnated asbestos gaskets. Cast body to mount directly on 4 inch round or cast outlet box with 4 non-ferrous screws. Provide suitable gasket for outlet. Ferrous metal parts shall have corrosion resistant finish.



GENERAL NOTES:

1. Top and bottom of fabric shall have twisted and barbed finish.
2. All metal shall be hot dipped galvanized.
3. Fences and gates shall be furnished complete with all necessary fittings.
4. For gates-sizes of pipe, sag rods and turnbuckles shall be as recommended by the manufacturer.
5. Fabric to be chain link 6'-0" wide, No. 9 guage, 2" mesh galvanized.
6. Concrete bases shall extend down below FROST LINE.
7. Gates shall be provided with a positive stop.
8. Fence to have overhang arm, 12 guage pressed steel or wrought iron, carrying 3 strands of 4 point barbed wire.



FENCE POST DETAILS

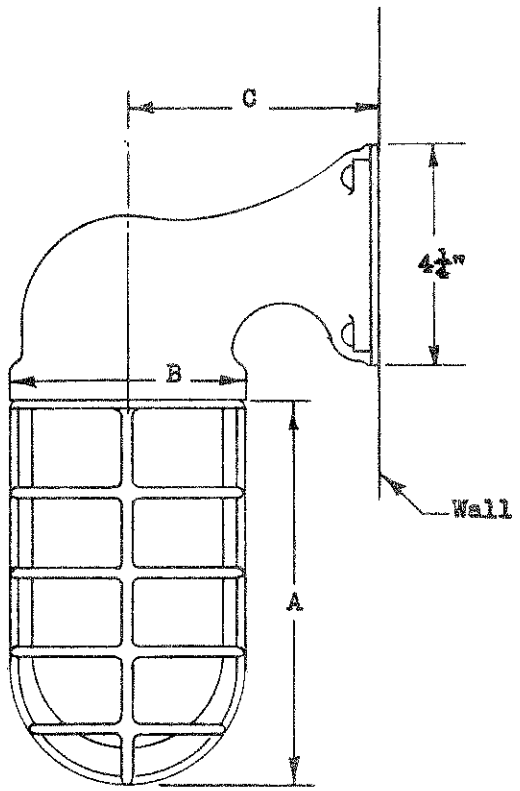
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TRANSFORMER PEN FENCE

6' FABRIC

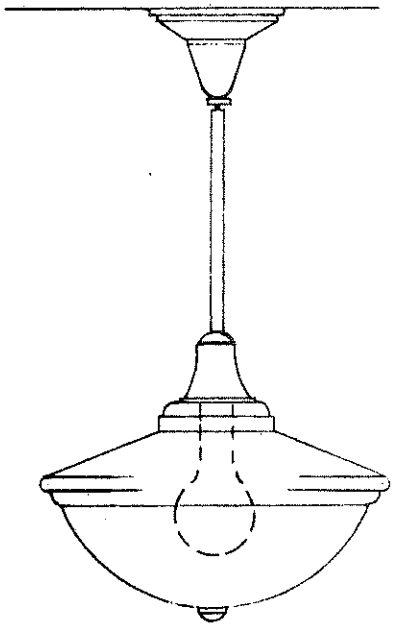
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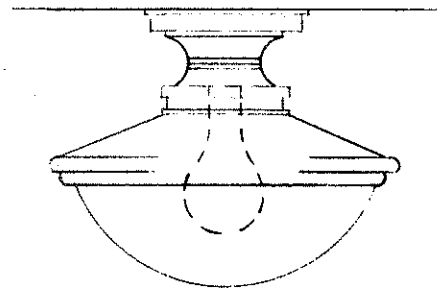


Type	Lamp Size	A	B	C
VG-3	50-100	6-1/8	4-3/8	2-7/8
VG-4	150-200	8-5/8	5-3/8	2-7/8

Bracket, weatherproof, heavy cast metal angle body with screw type cast metal guard and clear glass screw type globe. Provide screw terminal, heavy duty, porcelain lamp receptacle mounted in body with suitable impregnated asbestos gaskets. Cast body to mount directly on 4 inch round or cast outlet box with 4 non-ferrous screws. Provide suitable gasket for outlet. Ferrous metal parts shall have a corrosion resistant finish.



Type ES

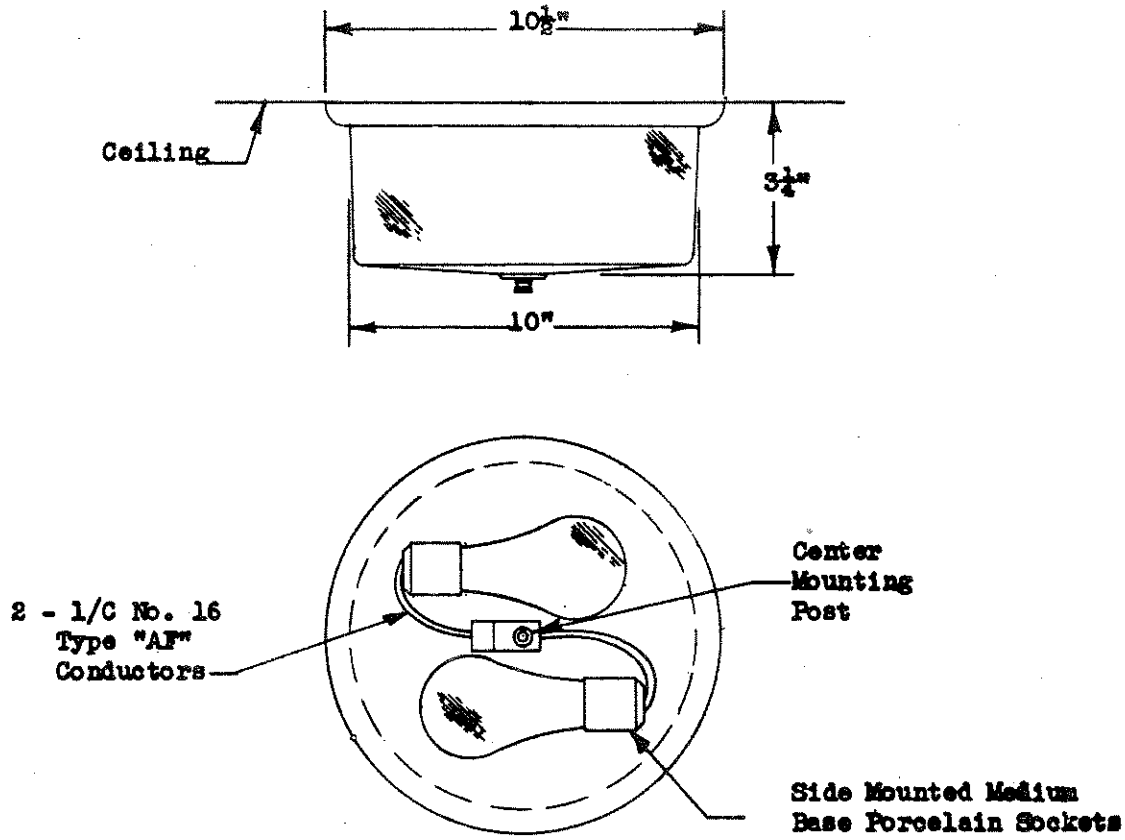


Type EC

Pendant Type	Watts	Ceiling Type
ES-1	100-150	EC-1
ES-2	200	EC-2
ES-3	300	EC-3
ES-4	500	EC-4

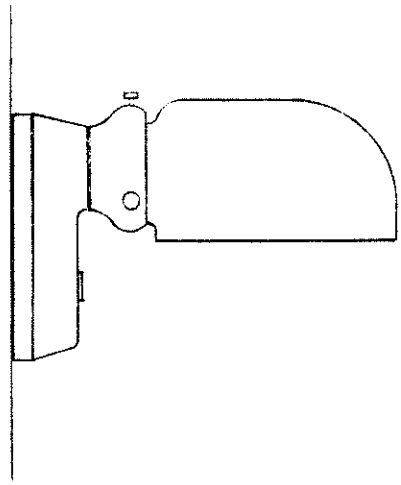
Fixtures to be of the pendant or ceiling type as indicated. All metal to be of not less than No. 20 gauge steel or brass. Glass holders shall be of the safety, screwless type and shall be provided with a porcelain keyless socket. Mogul sockets to be provided for 300 and 500 watt fixture. Finish of all exposed metal parts to be statuary bronze while the inside reflecting surface of holders shall be of white enamel.

Glassware to be of the highest grade diffusing glass having low absorption. Efficiency to be not less than 83% with a maximum brightness of not more than 3.0 candlepower per square inch, when viewed at any angle below a horizontal plane through the neck of the globe. Glass diameter to be 12" for 100-150 watt lamps, 14" for 200 watt, 16" for 300 watt and 18" for a 500 watt lamp.



TYPE CL-I

General diffusing, one piece, shallow band ceiling fixture with drum type, white opal glass globe for maximum of two 75 watt lamps. Shallow band and back plate to be one piece of 22 gauge metal with exposed portion of band to have polished chromium finish, reflector portion to have baked synthetic white enamel finish. Drum globe to be supported by center or side fastenings as required. Provide suitable felt washer under cap nut, if center supported.

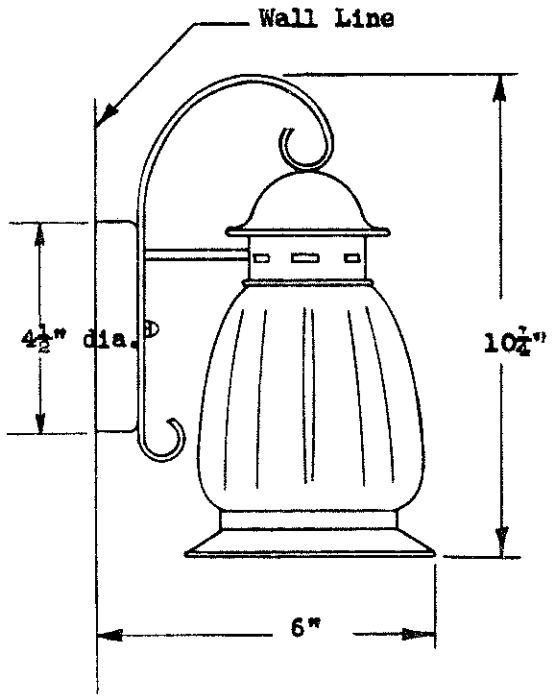


TYPE R-2.

Wall bracket consisting of a glazed, white porcelain base, medium base keyless socket, single receptacle and a glass shade. Receptacle to be removable. Shade to be of white or opal glass. Height of base to be not less than 5". Shade holder screws to be of brass, or of steel with polished chromium finish. Fixture to be suitable for mounting on either a 3¼" or 4" outlet box.

TYPE R-3.

Same as above except fixture to be furnished with a pull chain switch.



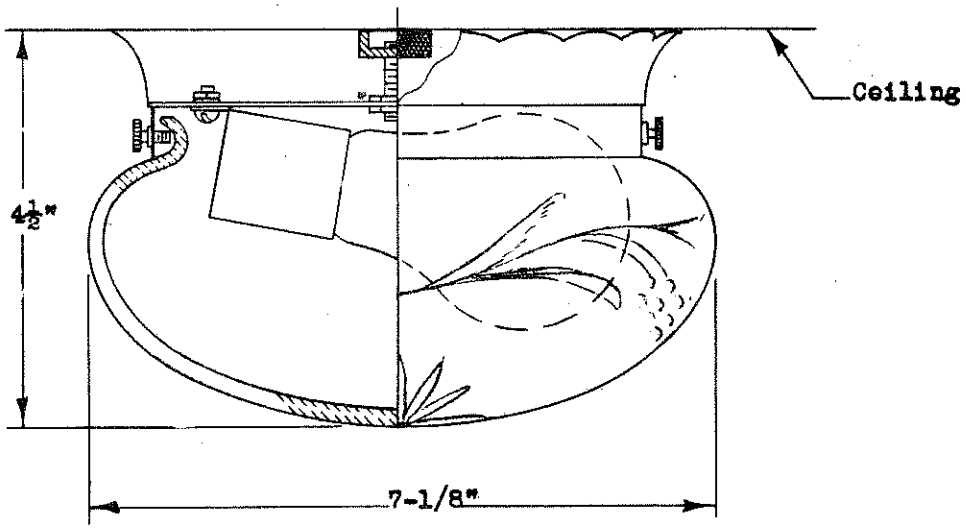
TYPE R-5

One light weatherproof bracket fixture constructed of not less than 0.028" thick (23 ga.) brass and fitted with medium base porcelain socket for 40 watt lamp. Curved arm shall be of 0.125" thick aluminum. All parts except ornamentation shall have a high lustre black polymerizing type resin base finish. All high lustre finishes shall be acid dipped, polished and sealed with a water-white baked lacquer.

Glass to be clear, thick, pressed and polished with flutings or other ornamental design and shall be held in place by knurled brass screws.

Fixture shall be wired with #18 ga. moisture resistant thermo-plastic insulated conductors.

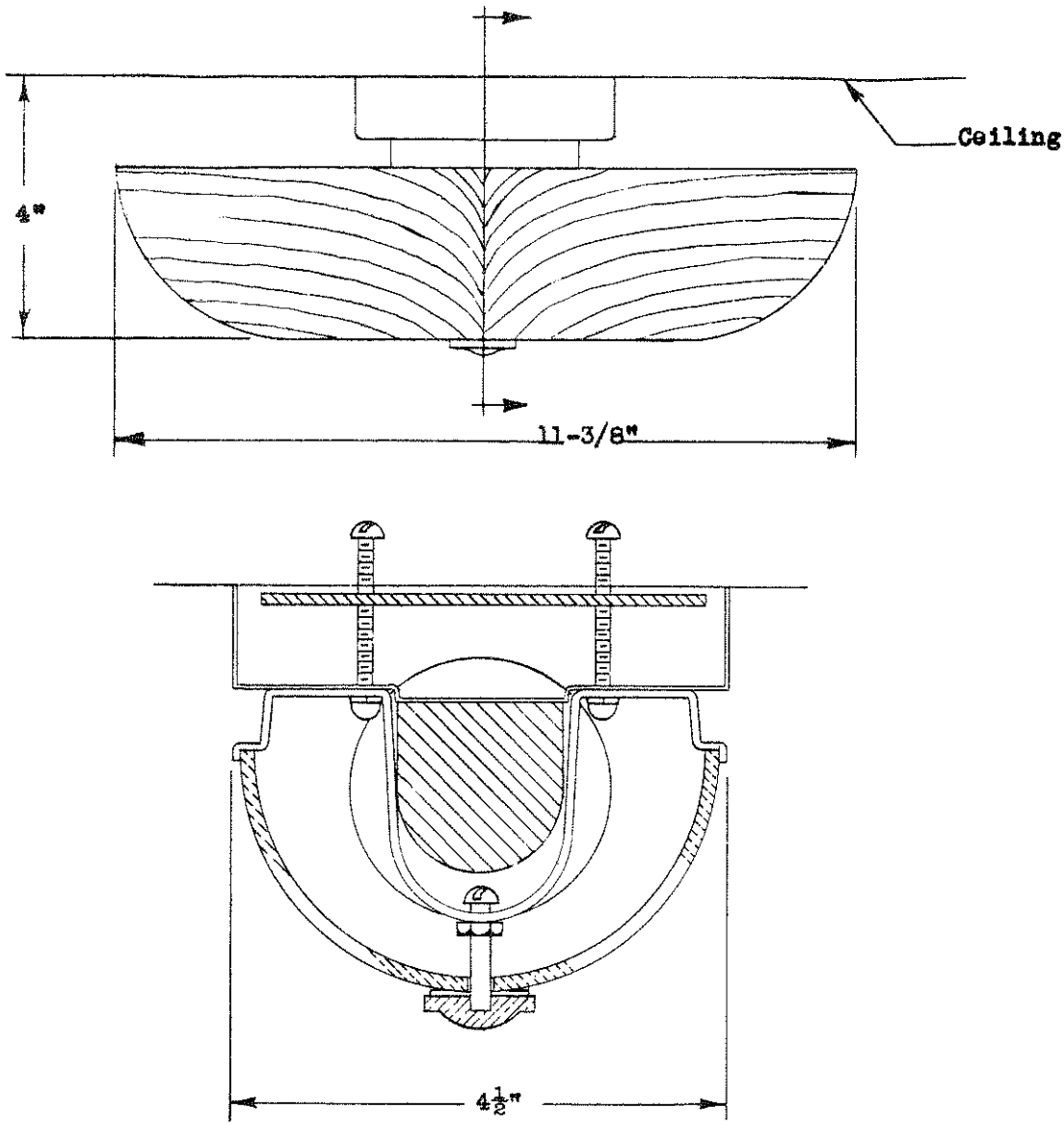
Screws, fittings and ornamentation shall have a high lustre brass finish.



TYPE R-9

Ceiling fixture, 40 watt size, with one light medium base porcelain socket wired with heat resistant asbestos covered wire, 18 gauge. Scalloped canopy of 22 gauge brass. All exposed metal parts to be finished in high lustre, acid dipped, polished and protected against deterioration by water-white baked lacquer.

Glass to be frosted, with colonial cut design.



Section

TYPE R-10

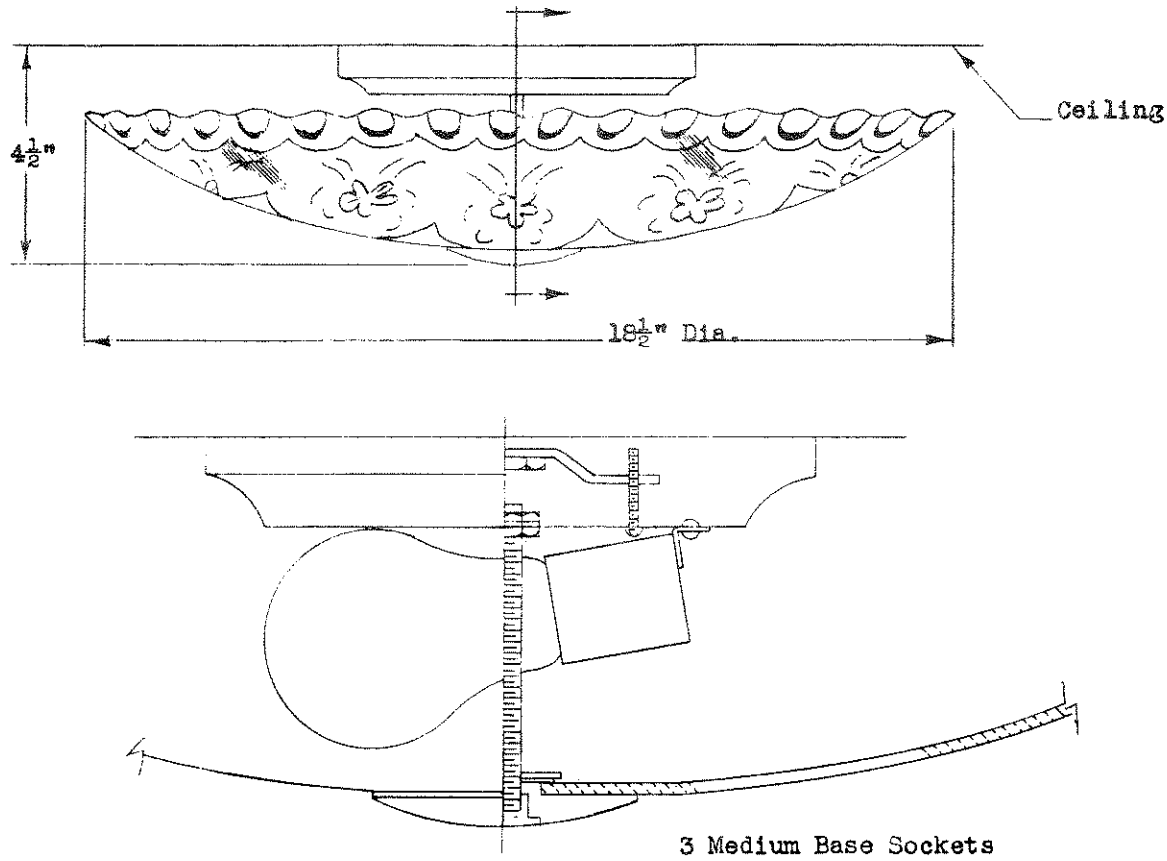
Two light ceiling fixture with medium base twin porcelain socket to take up to two 60 watt lamps. Canopy and glass support shall be of aluminum with polished finish. Exposed metal parts to be acid dipped, polished and protected against deterioration by water-white baked lacquer.

White bent glass shield to have modern design.

15 August 1950

Dwg. No. 40-06-04
Sheet 33

ARMY NED BOSTON



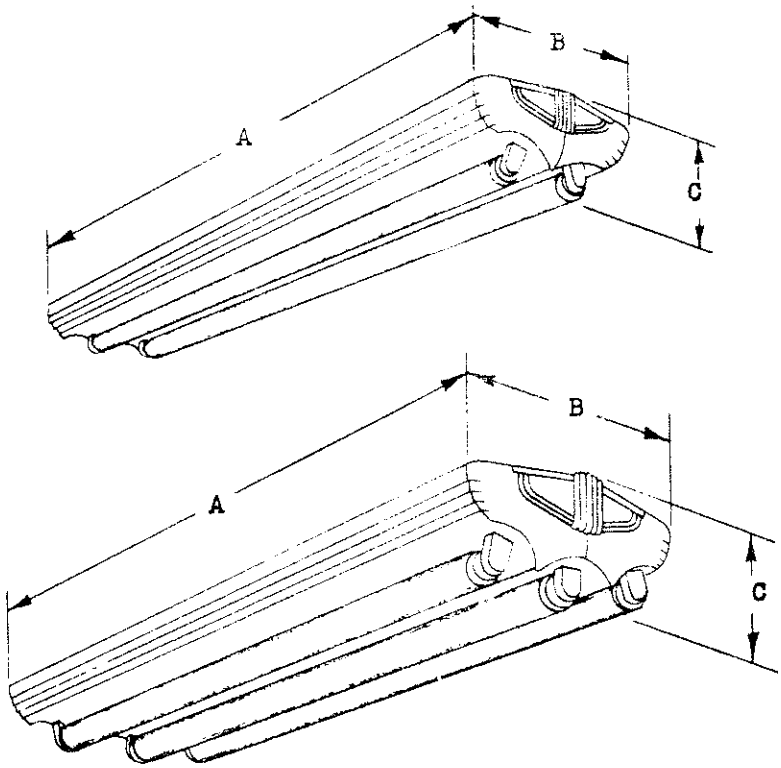
Section

TYPE P-12

Three light ceiling fixture with medium base porcelain sockets wired with heat resistant asbestos covered wire, 18 gauge, to take up to three 40 watt lamps. Canopy of 0.022" thick (24 gauge) steel; bottom disk of 0.035" thick (20 gauge) brass.

Metal holder finished in semi-gloss white enamel. Bottom knob finished in high lustre brass. All metal parts acid dipped, polished and protected against deterioration by water-white, baked lacquer.

Swirling three color floral silk screen pattern white glass with clear, thumb print scalloped edge, annealed edges to minimize chipping.

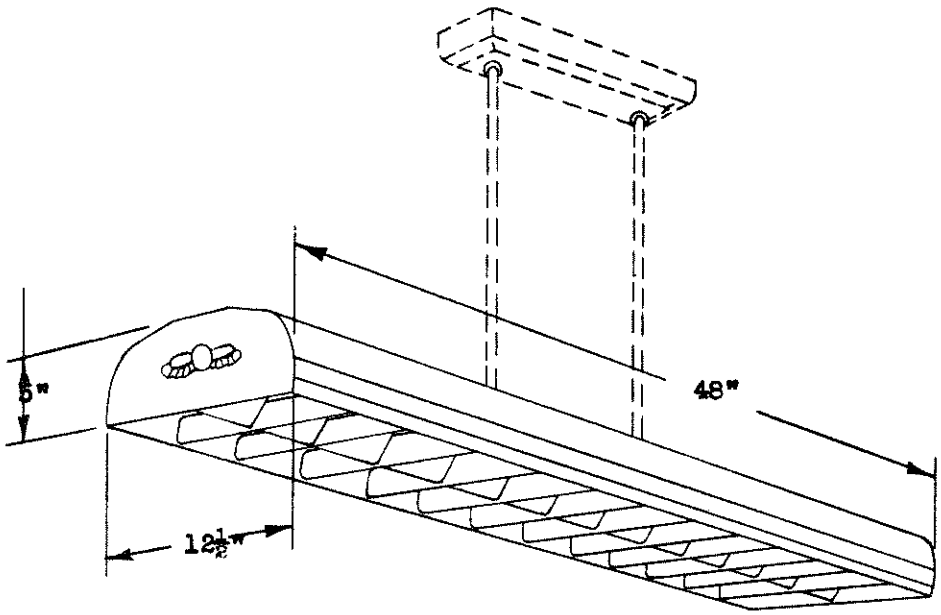


TYPE F-7 (Surface mounting)
TYPE F-8 (Suspension mounting)

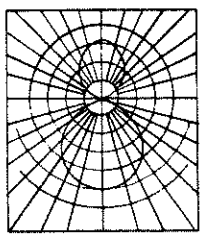
Lamp Watts	Dimensions, Inches A	B	C
2-20	28	9½	4-3/8
3-20	28	11½	5¼
2-40	52	9½	4-3/8
3-40	52	11½	5¼

Exposed tube, commercial ceiling type fluorescent fixture providing maximum wide spread and downward illumination suitable for surface or suspension mounting. 40 watt fixtures shall be suitable for continuous row mounting. Body shall be heavy gauge die formed steel treated to prevent oxidation and finished with a baked on synthetic white enamel finish. Provide hanger straps or pendants as specified. Unit to be completely wired with No. 16 Type "AF" conductors and equipped with all necessary auxiliaries conforming to Federal Specifications W-L-131. Starters shall be of the lockout type manually reset and ballasts shall be of the high power factor multi-lamp type.

Number and rating of lamps to be as specified or as noted on project drawings.



TYPE F-13 (Pendant mounting)
TYPE F-131 (Pendant mounting, continuous)
TYPE F-14 (Surface mounting)
TYPE F-141 (Surface mounting, continuous)



Typical Distribution

Ceiling or suspended commercial type of steel with curved steel side panels and shielding with direct-indirect type distribution. Unit shall be suitable for surface or pendant mounting individually or in continuous rows, as specified. Reflector top housing and ends to be die formed of 20 gauge steel treated to prevent oxidation and outer surfaces finished with baked on metallic silver grey enamel. Louvers shield to be of steel designed and spaced to provide shielding of at least 35° crosswise and 25° lengthwise. Reflector, all interior finishes and louver vanes to be finished with high reflecting factor synthetic white enamel. Lampholder brackets to be of 0.05" thick (18 gauge) steel. Fixture to be completely wired for two 40 watt fluorescent lamps. Auxiliaries to conform to Federal Specifications W-L-131. Starters shall be of the lockout type manually reset. Ballasts shall be of the high power factor multi-lamp type. Individual units to be supported with twin stem pendant. Minimum overall efficiency shall be not less than 82%. Number of fixtures required for continuous strips to be as specified or as noted on project drawings.

SECTION 26

HEATING SYSTEMS, FORCED-WARM-AIR; OIL-FIRED FURNACE
(Items 78 & 83)

(Index)

Paragraph No.	Paragraph Title	Page No.
26-01	Scope	26-1
26-02	Applicable Publications	26-1
	a. Federal Specifications	26-1
	b. Military Specification	26-1
	c. U.S. Department of Commerce Commercial Standards	26-1
	d. American Standards Association Standard	26-2
	e. National Association of Fan Manufacturers, Inc. Bulletin	26-2
	f. National Board of Fire Underwriters Pamphlets	26-2
26-03	General	26-2
	a. Standard Products	26-2
	b. Approval of Materials and Equipment	26-2
	c. Standards of Underwriters' Laboratories, Inc.	26-3
26-04	Materials and Equipment	26-3
	a. Aluminum Sheets	26-3
	b. Asphalt Varnish	26-3
	c. Copper Tubing	26-3
	d. Electrical Materials and Appliances	26-3
	e. Firebrick	26-3
	f. Fire Clay	26-3
	g. Galvanized Iron or Steel Sheets	26-3
	h. Gate Valves	26-3
	i. Mechanical Equipment	26-3
	j. Pipe Fittings	26-4
	k. Pipe Threads	26-4
	l. Steel Pipe	26-4
	m. Steel Sheets (Uncoated)	26-4
	n. Unions	26-4
26-05	Workmanship	26-4
26-06	Furnace Unit	26-4

Paragraph No.	Paragraph Title	Page No.
	a. General	26-4
	b. Heat Exchanger	26-4
	c. Combination Chamber	26-4
	d. Cabinet Encasing	26-5
	e. Supply-Fan Unit	26-5
	f. Air Filters	26-5
26-07	Oil-Burning Equipment	26-5
	a. Oil Burner	26-5
	b. Motor	26-6
	c. Automatic Draft Regulator	26-6
	d. Fuel-Oil Storage Tank	26-6
	e. Oil Pipe and Fittings	26-6
26-08	Fuel Oil Gage	26-6
26-09	Controls	26-7
	a. Bonnet Thermostats	26-7
	b. Room Thermostats	26-7
26-10	Smoke Connections	26-7
26-11	Flexible Connections	26-7
26-12	Ductwork	26-8
26-13	Registers	26-8
26-14	Electrical Work	26-8
26-15	Painting and Finishing	26-8
26-16	Operation and Maintenance Instructions	26-8
26-17	Tests	26-9
26-18	General Controls	26-9
	a. Pneumatic Controls	27-9
26-19	Guaranty	26-9
26-20	Payment	26-10

SECTION 26

HEATING SYSTEMS, FORCED-WARM-AIR; OIL-FIRED FURNACE
(Items 78 & 83)

26-01. SCOPE. - This section covers the installation of the forced-warm-air heating systems, complete, for the Water Supply Intake Tower and the Flood Control Operating House.

26-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specifications.

HH-B-671d	Brick; Refractory, Fire-Clay
HH-C-451c	Clay; Fire, Ground
QQ-A-359d	Aluminum-Alloy Plate and Sheet 3003
QQ-S-636	Steel; Carbon (Low-Carbon), Sheets and strips
QQ-S-775a	Steel, Sheets, Carbon, Zinc-Coated
TT-V-51a	Varnish; Asphalt
VV-F-815 & Am-1	Fuel Oil Burner
WW-P-406b	Pipe; Steel (Seamless and Welded)(For Ordinary Use)
WW-P-521d & Am-1	Pipe-Fittings; Malleable-Iron, Wrought Iron and Steel, (Screwed), 150 Pound
WW-T-799a & Am-1	Tubing; Copper, Seamless (for Use with Solder-Joint or Flared-Tube Fittings)
WW-U-531a	Unions; Pipe; Steel or Malleable Iron, Threaded Pipe Connection, 250 p.s.i. WSP; 500 p.s.i. WOG (cold, nonshock)
WW-V-0054a (GSA-FSS)	Valves, Bronze, Gate; 125- and 150-Pound, Screwed and Flanged (for Land Use)
WW-V-58 & Am-1	Valves, Cast-Iron, Gate; 125- and 250-Pound, Screwed and Flanged (for Land Use)
GGG-P-351a	Pipe-Threads; Taper (American-National)

b. Military Specification.

MIL-P-15147B	Primer and Enamel, Coal Tar.

c. U.S. Department of Commerce Commercial Standards.

CS75-56	Automatic Mechanical-Draft Oil Burners Designed for Domestic Installations
CS195-54	Warm Air Furnaces Equipped with Pressure Atomizing or Rotary Type Oil Burners

d. American Standards Association Standard. -

B19-1938	Safety Code for Compressed Air Machinery and Equipment

e. National Association of Fan Manufacturers, Inc., Bulletin. -

No. 110	Standards, Definitions, Terms and Test Codes for Centrifugal, Axial and Propeller Fans (Current Issue)

f. National Board of Fire Underwriters Pamphlets. -

No. 31	Installation of Oil Burning Equipment (Current Issue)
No. 90A	Air Conditioning and Ventilating Systems of Other than Residence Type (Current Issue)
No. 90B	Residence Type Warm Air Heating and Air Conditioning Systems (Current Issue)

26-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the heating system. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted in writing as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the Contracting Officer. The dimensions of the heater room are as indicated on the drawings. Heating equipment, ductwork, and piping arrangements shall provide adequate and acceptable clearances for entry, servicing, and maintenance. The warm-air heating installation shall conform to Pamphlets Nos. 90A and 90B of the National Board of Fire Underwriters.

a. Standard Products. - The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, component parts of the system need not be the products of the same manufacturer.

b. Approval of Materials and Equipment. - As soon as practicable and within 30 days after the date of award of the contract and before commencement of the installation of any materials or equipment, a plan and necessary elevations of the equipment-room layout showing the proposed heating equipment, ductwork, and all applicable appurtenances therefor, with clearances, together with a complete schedule of the materials and equipment proposed for installation shall be submitted in six copies for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of equipment under this provision shall not be construed as authorizing any deviations from the specification,

unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided the contractor clearly states such differences and provided all essential requirements of the specification are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

c. Standards of Underwriters' Laboratories, Inc. - The contractor shall submit proof that the hereinafter specified furnace unit, permanent-type air filters if required, and oil-burning equipment which he proposes to furnish, conform to the standards of the Underwriters' Laboratories, Inc. The label of listing of the Underwriters' Laboratories, Inc., will be accepte as evidence of conforming to this requirement. In lieu of such label or listing, the contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the furnace unit, air filters, and oil-burning equipment have been tested and conform to the standards, including method of test, of the Underwriters' Laboratories, Inc.

26-04. MATERIALS AND EQUIPMENT. - The following materials and equipment shall conform to the respective specifications and other requirements specified below:

a. Aluminum Sheets. - Federal Specification QQ-A-359, temper H12 or H22.

b. Asphalt Varnish. - Federal Specification TT-V-51.

c. Copper Tubing. - Federal Specification WW-T-799, type suited to use intended.

d. Electrical Materials and Appliances. - Section, ELECTRICAL WORK; INTERIOR, of these specifications.

e. Firebrick. - Federal Specification HH-B-671, low-duty.

f. Fire Clay. - Federal Specification HH-C-451, Class C.

g. Galvanized Iron or Steel Sheets. - Federal Specification QQ-S-775, Class D.

h. Gate Valves. - Sizes of 1-1/2 inches or less, Federal Specification WW-V-54, Class A; 2-inch size, Federal Specification WW-V-58, Class A, Designation NS; over 2-inch size, Federal Specification WW-V-58, Class A, Designation OS or OF as required.

i. Mechanical Equipment. - Major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each

major component of equipment shall have the manufacturer's name, address, and catalog number on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agency only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

j. Pipe Fittings. - Federal Specification WW-P-521, class as required to match adjacent piping.

k. Pipe Threads. - Federal Specification GGG-P-351.

l. Steel Pipe. - Federal Specification WW-P-406, Type I, Class A, coating as hereinafter specified.

m. Steel Sheets (Uncoated). - Federal Specification QQ-S-636, composition, condition, and finish as best suited for the end use.

n. Unions. - Federal Specification WW-U-531, class as required to match adjacent piping.

26-05. WORKMANSHIP. - Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

26-06. FURNACE UNIT. - a. General. - The furnace shall have a capacity not less than indicated on the drawings when fired with No. 2 commercial fuel oil. All materials necessary for proper assembly shall be furnished with each furnace. When furnace casings, blowers, motors, and other parts of equipment are shipped unassembled, all parts shall have been made so as to permit field assembly without grinding, drilling, or similar work. The furnace shall fit the space in which it is to be installed so as to allow ample room for maintenance. The furnace shall have combustion spaces designed to withstand possible explosions resulting from delayed ignition of the oil. The unit shall conform to all applicable requirements contained in Commercial Standard CS195, and to the requirements of the Underwriters' Laboratories, Inc.

b. Heat Exchanger. - Heat exchanger shall have a high efficiency of heat transfer between the products of combustion and the circulated air for heating. The gas passages shall be designed to minimize air friction. All seams in the heat exchanger shall be riveted or welded, and the heat exchanger shall be so constructed that the warm air for heating will not be subject to contamination. The heat exchanger shall be designed to allow the metal to expand or contract without causing damage to any part, and shall be constructed of steel and cast iron of suitable composition and weight.

c. Combustion Chamber. - Combustion chamber shall be constructed of firebrick laid in thin fire-clay batter, stainless steel, or other refractory material approved as equal.

d. Cabinet Encasing. - Cabinet encasing the heat exchanger and pan humidifier shall be properly insulated, and protected against corrosion by means of enamel or other suitable protective finish. Galvanized-iron liners forming 1 inch air spaces will be considered as complying with the requirements for insulated cabinets. Cabinets shall be constructed of sheet metal not lighter than 0.0179 in. (26 gage).

e. Supply-Fan Unit. - Supply-fan unit shall have a c.f.m. capacity and external static pressure not less than that indicated on the drawings. The fan unit shall be encased in a rigid housing designed to contain both fan and filters. The external static pressure indicated on the drawings for the fan shall be considered as representing the pressure loss through the ductwork only, and shall be increased adequately to compensate for the loss through the furnace and filters. The fan shall be rated and constructed in accordance with Bulletin No. 110 of the National Association of Fan Manufacturers, Inc. The fan shall be mounted on approved sound-absorbing foundation pads, and shall be practically noiseless in operation. The contractor shall submit printed catalog evidence showing that fan capacity and speed is certified for quiet operation. Impeller wheels shall be the multiblade type, heavily and rigidly constructed. Each wheel shall be supported by two bearings, and shall be accurately balanced both statically and dynamically. Fans may be either directly or indirectly connected to the driving electric motors. V-belt drives shall be designed for at least 50 percent overload capacity. Electric motors shall be an open type, suitable for the available electric service, and provided with thermal-overload protection. Motors shall conform to ELECTRICAL WORK; INTERIOR.

f. Air Filters. - Throw-away type air filters 2 inches thick shall be installed.

26-07. OIL-BURNING EQUIPMENT. - Oil-burning equipment shall include the oil burner, motor, ignition equipment, controls, oil-storage tank, oil pipe and fittings, and all other items necessary for the complete installation of a fully automatic oil-burning heating system. All fuel-oil-burning equipment shall conform to the requirements of the Underwriters' Laboratories Inc., and shall be installed in accordance with Pamphlet No. 31 of the National Board of Fire Underwriters.

a. Oil Burner. - Oil burner shall conform to the requirements of United States Department of Commerce Commercial Standard CS75 when within the scope thereof. The oil burner shall be a mechanical atomization type, suitable for handling No. 2 fuel oil without preheating the oil. The burner shall be quiet in operation, and shall operate with a balanced flame so as not to localize heat in any part of the combustion chamber. The burner shall be capable of completely atomizing and effectively mixing the oil with the air so as to insure complete combustion. The air admitted shall be of sufficient quantity for complete combustion, but not of such quantity as to produce an undue percentage of excess air with the attendant high stack loss.

b. Motor. - The oil-burner motor shall be totally enclosed and shall be provided with thermal-overload protection. The motor shall suit the characteristics of the available electric service and shall conform to ELECTRICAL WORK; INTERIOR. The motor shall have sufficient capacity to operate the oil pump and fan so as to develop 100 percent of the specified furnace rating.

c. Automatic Draft Regulator. - Automatic draft regulator shall be installed in the side of the smoke pipe. The regulator shall consist of a weighted and balanced damper of proper size for the furnace capacity. The damper shall open or close automatically as the chimney draft varies, so as to maintain a constant draft at the furnace outlet.

d. Fuel-Oil Storage Tank. - Fuel-oil storage tank for the water supply intake tower shall have a capacity as indicated on the drawings. Tank shall be constructed in accordance with the standards of National Board of Fire Underwriters Pamphlet No. 31 and certification to that effect shall be furnished to the Contracting Officer, except minimum thickness shall be 7 gauge. The tank shall be provided with welded reinforced threaded openings or flanges for all pipe connections, including oil-fill, vent, and oil-burner connections. A lock fill cap shall be provided with watertight fill box for the tank and shall be installed where indicated or directed. Tank for the flood control operating house is provided under Section, DIESEL ENGINE GENERATOR SET. Piping shall be under this section.

(1) The tank at the water supply intake tower shall be cleaned thoroughly of all loose rust, blisters, loose scale, oil paint of type different from the field primer and other substances that would interfere with the proper adhesion of the protective coating. Mill scale that cannot be removed by hand wire-brushing need not be removed. Oil and grease shall be removed with mineral spirits or other acceptable solvent having a flash point higher than 80°F. After cleaning, the outside of the tank shall be primed and coated with Bitumastic No. 50 or approved equal.

e. Oil Pipe and Fittings. - Oil pipe shall be Type "K" copper tubing with flared joint type compression fittings.

26-08. FUEL OIL GAGE. - The fuel oil gage for the Flood Control Operating House is included under Section 23. The fuel oil gage in the Water Supply Intake Tower shall be of the automatic remote-reading type capable of indicating the amount of fuel oil in the storage tanks. The gage shall be float operated; the motion of the float operating against the bellows of a closed hydraulic system. The indicators shall be mounted on the wall where shown on the drawings and shall have large, easily read scale, graduated in gallons. The flexible hydraulic tubing from the indicator to the float mechanism shall be protected by metallic armor. The connection at the tank shall be protected from physical damage by structural steel box of suitable size. The gage shall be similar and approved equal to "Liquidometer Junior" as manufactured by the Liquidometer Corporation of Long Island City, New York. The contractor shall furnish and install a "Scully" or approved equal vent alarm for the tank.

26-09. CONTROLS. - Controls for each furnace shall consist of a room thermostat, a combination high- and low-limit bonnet thermostat, and a stack switch. The room thermostat shall start or stop the oil burner automatically as the room temperature respectively falls below or rises above the predetermined point. The high-limit bonnet thermostat shall be arranged to take control from the room thermostat and shut off the oil burner whenever the bonnet temperature rises above the predetermined high limit. The low-limit bonnet thermostat, set at approximately 90°F., shall be arranged to cause the supply fan to start and run continuously whenever the bonnet temperature is above the predetermined point. No means independent of the bonnet thermostat shall be provided whereby the circulating fan circuit can be interrupted. A delayed-action stack switch or equivalent device shall be installed to shut off the oil burner automatically in case the oil fails to ignite on starting.

a. Bonnet Thermostats. - Bonnet thermostats shall be an electric type and shall be suitable for operation in conjunction with the supply fan and heat-regulating devices. Bonnet thermostats shall be designed with an approximate high-limit range of from 100°F. to 250°F. with an approximate differential of 25°F., and with an approximate low-limit (fan) range of 50° to 200°F. with a differential of approximately 25°F. The thermostats may be combined as one instrument. Thermostats shall be provided with means of locking the settings. Each thermostat shall be equipped with a flange or other device to provide a space of not less than 1 inch between the sheet metal of the bonnet and the thermostat housing containing the electrical switches.

b. Room Thermostats. - Room thermostats shall be the lock-shield type equipped with thermometers. Thermostats shall be designed to operate on not more than a 3°F. differential over a temperature range of approximately 55° to 85°F. and shall be set to maintain a room temperature of approximately 70°F.

26-10. SMOKE CONNECTIONS. - Each furnace shall be connected to the stack or flue by means of a smoke connection constructed of black iron or steel sheets not less than 0.0478 inch in thickness (18 gage). The clear distance between uncovered smoke connections and combustible material or construction, including plaster on combustible base, shall be not less than 18-inches. The clearance may be reduced to 9 inches where the smoke connection is protected by not less than 1 inch of asbestos or its equivalent or where combustible material in ceilings, beams, or walls is protected by sheet metal or equivalent covering placed at least 1 inch from the surface to be protected and extending the full length of the smoke connection and not less than 12 inches beyond it on both sides. Suitable cleanouts shall be provided which will permit cleaning the entire smoke connection without dismantling.

26-11. FLEXIBLE CONNECTIONS. - Flexible connections of asbestos or glass fabric, to prevent the transmission of vibration through the ducts

to the rooms, shall be installed on both the supply and return sides of the heat exchanger, approximately where shown on the drawings. Where the supply fan is installed adjacent to, but separated from the heat-exchanger casing, the flexible connections shall be installed on the intake and discharge sides of the fan unit. Cloth used for flexible connections shall be of proper weight and strength for the service required, and shall be properly filled to be rendered relatively airtight.

26-12. DUCTWORK. - Sheet metal work indicated on the drawings, specified, or required for the heating of the buildings shall be erected in a first-class workmanlike manner, and shall be approved by the Contracting Officer. Ducts, unless otherwise approved, shall be true to the dimensions indicated on the drawings and straight and smooth on the inside, with neatly finished joints. The ducts shall be securely anchored to the building in a manner approved by the Contracting Officer and shall be so installed as to be completely free from vibration under all conditions of operation. The ducts shall be properly braced and reinforced with steel angles or other structural members spaced not more than 60 inches on centers. Slip joints shall be made in the direction of flow, and unless otherwise indicated on the plans, elbows shall have a centerline radius not less than one and one-half times the width of the duct. The sheet metal used shall be galvanized iron or steel, or aluminum. The thickness of the sheet metal shall be not less than 24 gage.

26-13. REGISTERS. - Registers shall be of sturdy construction with adjustable vertical or horizontal deflector vanes set as shown on the drawings or as directed by the Contracting Officer. Suitable key-operated volume dampers shall be provided behind the face of each register.

26-14. ELECTRICAL WORK. - All manual or automatic control and protective or signal devices required for the operation of the heating equipment herein specified and any wiring required but not indicated on the electrical plans shall be furnished and installed under this section of the specifications. Wiring shall conform to ELECTRICAL WORK: INTERIOR. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical-control device shall be submitted to the Contracting Officer for approval.

26-15. PAINTING AND FINISHING. - All oil piping, duct hangers, and other uncoated ferrous-metal work in areas having unpainted adjacent surfaces shall be thoroughly cleaned and given one coat of asphalt varnish. All other uncoated ferrous-metal work shall be primed and finish painted as specified in PAINTING.

26-16. OPERATION AND MAINTENANCE INSTRUCTIONS. - Printed instructions, glass-enclosed and framed, covering the operation and maintenance of each item of equipment shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of a competent engineer shall be provided for a period of not less than 1 day to instruct a representative of the Government in the operation and maintenance of the heating systems.

26-17. TESTS. - Upon completion and prior to acceptance of the installation, the contractor shall subject the heating system to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of 8 hours for each system, and shall include the following specific information in a report, together with conclusions as to the adequacy of the system.

a. Time, date, and duration of test.

b. Outside and inside dry-bulb temperatures.

c. Dry-bulb temperatures entering and leaving air-heating unit.

d. Air quantity in c.f.m. passing through each supply and return register or grille, and supply outlet damper setting.

e. Make, model, and size of each register and grille.

f. C.f.m. of outside air introduced into the system.

g. Supply-fan make, model, and size, r.p.m., static discharge pressure actually obtained, and total c.f.m. handled, as well as voltmeter and ammeter readings for the fan motor during operation.

h. Oil-burner make, model and rated capacity, and ammeter and voltmeter readings for the oil-burner motor.

i. Grade of fuel oil used.

All indicating instruments shall be read at half-hour intervals unless otherwise directed by the Contracting Officer. The report of the test shall be supplied in quadruplicate to the Contracting Officer. The contractor shall furnish all instruments, test equipment and test personnel that are required for the tests, and the Government will furnish the necessary fuel, water, and electricity.

26-18. OPTIONAL CONTROLS. - Pneumatic controls or electronic controls may be provided in lieu of electric controls.

a. Pneumatic Controls. - Where pneumatic controls are furnished, an air compressor of the standard piston type, complete with tank, valves, gages, filters, and other necessary appurtenances shall be provided. All air lines shall consist of suitable tubing with airtight fittings. The air compressor and tank shall be located as directed by the Contracting Officer. The pneumatic control system shall conform to American Standard B19.

26-19. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed as specified in the Guarantee paragraph of the SPECIAL CONDITIONS.

Air-heating unit.
Air-supply-fan unit.
Automatic heat-regulating equipment.
Oil burning equipment.

26-20. PAYMENT. - Payment for all work covered under this section, and all costs in connection therewith will be made at the applicable lump sum contract prices for Item No. 83, "Heating System, Water Supply Intake Tower" and Item 78, "Heating and Ventilating Systems, Flood Control Operating House".

SECTION 27

ELECTRICAL-EXTERIOR
(Item 87)

(Index)

Paragraph No.	Paragraph Title	Page No.
27-01	Scope	27-1
27-02	Applicable Publications	27-1
	a. Federal Specifications	27-1
	b. National Bureau of Standards Code	27-1
	c. American Institute of Electrical Engineers Standard	27-1
	d. American Society for Testing Materials Standards	27-2
	e. American Standards	27-2
	f. American Wood Preservers Association Stds.	27-2
	g. Edison Electric Institute Specifications	27-3
	h. National Board of Fire Underwriters Std.	27-3
	i. National Electrical Manufacturers Association Standards	27-3
27-03	General	27-3
	a. Capacities	27-3
	b. Codes	27-3
	c. Conformance with Agency Requirements	27-4
	d. Nameplates	27-4
	e. Prevention of Corrosion	27-4
	f. Standard Products	27-4
	g. Verification of Dimensions	27-5
27-04	Materials	27-5
	a. Bolts and Nuts	27-5
	b. Insulated Wire and Cable	27-5
	c. Conductors	27-7
	d. Conduit	27-7
	e. Crossarms	27-7
	f. Fuses, Power	27-7
	g. Fuse Cutouts, Primary	27-7
	h. Castings	27-7
	i. Connectors	27-8
	j. Ducts	27-8
	k. Fittings, Cable and Conduit	27-9
	l. Lamps, Incandescent	27-9
	m. Mortar	27-9

Paragraph No.	Paragraph Title	Page No.
	n. Outlets, Metal for Conduit	27-10
	o. Potheads	27-10
	p. Guy Strand	27-10
	q. Insulators	27-10
	r. Lightning Arresters	27-10
	s. Poles	27-10
	t. Pole-Line Hardware	27-10
	u. Solderless Connectors and Splices	27-10
	v. Steel, Structural and Miscellaneous	27-10
	w. Transformers, Power and Distribution	27-10
	x. Wood Preservative for Poles and Crossarms	27-10
	y. Zinc Coating for Ferrous Metals	27-10
27-05	Materials	27-11
27-06	Shop Drawings	27-11
27-07	Workmanship	27-11
	a. General	27-11
	b. Qualification of Cable Splicers	27-11
27-08	Duct System	27-11
27-09	Manholes	27-13
	a. General	27-13
	b. Hardware	27-15
	c. Ground Rods	27-15
27-10	Primary Cable Splicers	27-15
	a. Rating	27-15
	b. Cable Splicers	27-15
	c. Installation of Cable	27-16
27-11	Poles	27-16
27-12	Storage and Handling of Poles	27-16
27-13	Pole Setting	27-16
27-14	Crossarms	27-17
27-15	Crossarm Braces	27-17
27-16	Pins	27-17
27-17	Insulators	27-17
	a. General	27-17

Paragraph No.	Paragraph Title	Page No.
27-18	Guys	27-18
27-19	Line Conductors	27-18
27-20	Potheads	27-18
27-21	Pole-Line Hardware	27-19
27-22	Lightning Arresters	27-19
27-23	Distribution Transformers	27-19
	a. Fence-Enclosed Concrete Mat	27-20
27-24	Primary-Fuse Cutouts	27-21
27-25	Secondary Cable System	27-21
	a. Cable Splicers	27-21
	b. Service Connections to Buildings	27-21
27-26	Grounding	27-21
	a. Manhole Grounding	27-21
	b. Transformer-Station Grounding	27-22
	c. Building Grounding	27-22
	d. Lightning-Arrester Grounding Conductors	27-22
27-27	Connections Between Aerial and Underground Sections	27-22
27-28	Connection to Utility Lines	27-22
27-29	Bridge Lights	27-22
27-30	Concrete	27-22
27-31	Tests	27-23
	a. Operating Test	27-23
	b. Ground-Resistance Measurements	27-23
	c. Factory Test Reports	27-23
27-32	Guaranty	27-23
27-33	Payment	27-23

SECTION 27

ELECTRICAL-EXTERIOR
(Item 87)

27-01. SCOPE. - This section covers the installation of the electrical-distribution and bridge lighting systems and duct lines for telephone cables, complete.

27-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto:

a. Federal Specifications. -

W-C-571b	Conduit and Fittings; Nonmetal, Rigid; (Asbestos-Cement or Fireclay-Cement) (for Electrical Purposes).
W-C-581 & Am-2	Conduit and Fittings; Fiber, Bituminized.
W-C-586	Conduit Outlets (Cast-Iron, Malleable-Iron, and Cast-Aluminum, with Covers and Accessories -- for Shore Use).
W-F-408a	Fittings for Conduit, Metal, Rigid, (Rigid Steel and Electrical Metallic Tubing).
W-S-00610a (GSA-FSS)	Splice, Conductor.
W-T-631a & Am-3	Transformers, Power, Distribution.
FF-B-561a	Bolts, Lag.
FF-B-571a	Bolts; Nuts; Studs; and Tap-Rivets (and Material for Same).
QQ-I-652a	Iron Castings, Gray.
QQ-S-681b & Am-2	Steel; Castings.
QQ-W-336a & Am-3	Wire; Copper, Hard-Drawn.
WW-C-581c & Am-2	Conduit, Electrical, Steel, Rigid, Zinc-Coated.

b. National Bureau of Standards Code. -

H 30	National Electrical Safety Code.

c. American Institute of Electrical Engineers Standard. -

No. 48-1948	Potheads.

d. American Society for Testing Materials Standards. -

A 123-59	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip.
A 153-59	Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
D 256-56	Impact Resistance of Plastics and Electrical Insulating Materials.
D 543-56T	Resistance of Plastics to Chemical Reagents.
D 635-56	Flammability of Rigid Plastics over 0.050 Inch in Thickness.
D 638-58T	Tensile Properties of Plastics.
D 648-56	Deflection to Temperature of Plastics Under-Load.
D 696-44	Coefficient of Linear Thermal Expansion of Plastics
D 790-58T	Flexure Properties of Plastics.

e. American Standards. -

C29.8 - 1957 (EEI TDJ-58; NEMA 146-1956)	Wet-Process Porcelain Insulators, (Apparatus-Cap and Pin Type).
C29.9 - 1957 (EEI TDJ-59; NEMA 147-1956)	Wet-Process Porcelain Insulators (Apparatus-Post Type).
C57.12.00-1958 .12.10-1958 .12.20-1959 .12.80,.90-1958	Distribution, Power, and Regulating Transformers, and Reactors Other than Current-Limiting Reactors, Requirements, Terminology, and
C57.12(Sec. 40)-1957	Test Code for.
C29.1-1944 (AIEE 41-1944)	Insulator Tests.
C29.2 through C29.7 1955 (EEI TDJ-52 through 57; NEMA 140 through 145-1952).	Wet-Process Porcelain Insulators: Suspension, Spool, strain, Low- and Medium-Voltage Pin, High-Voltage Pin, and High-Voltage Line-Post Types.
05.1-1948	Wood Poles.

f. American Wood Preservers Association Standards. -

C4-59	Preservative Treatment of Poles by Pressure Processes.
C25-57	Preservative Treatment of Cross-arms by Pressure Processes.
P1-54	Creosote.
P8-51	Oil-Borne Preservatives.
P9-58	Petroleum Used in Pentachlorophenol and Copper Napthenate Solutions.

g. Edison Electric Institute Specifications. -

TD-1	Steel Bolts and Nuts.
TD-2	Strand-Eye Anchor Rods.
TD-3	Lag Screws.
TD-4	Eye Bolts.
TD-5	Eyenuts and Eyelets.
TD-6	Steel Cross Arm Braces.
TD-9	Single Tube Seamless Copper Splicing Sleeves.
TD-10	Rolled Steel Washers.
TD-11	Guy Hooks and Guy Strain Plates.
TD-12	Pole Guards.
TD-14	Moulding Staples.
TD-15	Pole and Tower Steps.
TD-16	Line Hardware Materials Inspection Procedure.
TD-17	Bolt Type Steel Insulator Pins with One-Inch Diameter Lead Threads.
TDJ-19	Standard Mounting Bracket for Distribution Cutouts and Distribution Lightning Arresters.
TD-21	Steel Clevises for Guy Strain Insulators.
TD-22	Pole Top Pins.
TD-23	Guy Clamps.
TD-24	Porcelain Wireholders.
TD-90	Douglas Fir Crossarms, Treated or Untreated.
TD-91	Dense Southern Pine Crossarms, Preservative Treated.

h. National Board of Fire Underwriters Standard. -

NBFU No. 70	National Electrical Code (Current Issue).

i. National Electrical Manufacturers Association Standards. -

LA 1-1958	Lightning Arresters.
TR 1-1960	Transformers.
TR 2-1956	Overhead Type Distribution Transformers.
WC 3-1959	Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

27-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the electrical distribution and bridge lighting systems.

a. Capacities. - Capacities of all equipment and material shall be not less than those indicated.

b. Codes. - The installation shall comply with the applicable requirements and recommendations of the National Electrical Code and the National Electrical Safety Code.

c. Conformance with Agency Requirements. - Where materials or equipment are specified to conform to the standards of the Underwriters' Laboratories, Inc., or to be constructed or tested, or both, in accordance with the standards of the National Electrical Manufacturers Association or the American Standards Association, the contractor shall submit proof that the items furnished under this section of the specifications conform to such requirements. The label of, or listing by the Underwriters' Laboratories, Inc., will be acceptable as sufficient evidence that the items conform to Underwriters' Laboratories, Inc., requirements. A certification or published catalog specification data statement to the effect that the item is in accordance with the referenced NEMA standard by a company listed as a member company of NEMA for the section whose standards cover the item under consideration, will be acceptable as sufficient evidence that the item conforms to the requirements of the National Electrical Manufacturers Association. In lieu of such stamp, certification, label or listing, the contractor may submit a written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing of the specified agencies. Conformance with the agency requirements does not relieve the item from complying with any other requirements of the specifications.

d. Nameplates. - Each major component of equipment shall have as a minimum the manufacturer's name, address, and catalog number, model, style, or type on a plate securely and conspicuously attached to the item of equipment. Nameplates for electrical apparatus shall conform to the referenced NEMA standards.

e. Prevention of Corrosion. - All metallic materials shall be protected against corrosion. Exposed metallic parts of outdoor apparatus shall be given a rust-inhibiting treatment and standard finish by the manufacturer. Aluminum shall not be used in contact with the earth, and where connected to dissimilar metal shall be protected by approved fittings and treatment. All parts such as boxes, bodies, fittings, guards, and miscellaneous parts made of ferrous metals but not of corrosion-resistant steel, shall be zinc-coated in accordance with ASTM A 123 or A 153, except where other equivalent protective treatment is specifically approved in writing by the Contracting Officer. Steel conduits installed underground or under slabs on grade shall be coated with an approved asphaltic paint, plastic coating, or shall be wrapped with a single layer of a pressure-sensitive plastic tape, half-lapped.

f. Standard Products. - Materials and equipment shall be essentially the standard catalog product of a manufacturer regularly engaged in the manufacture of the product, shall meet the requirements of the specification, and essentially duplicate materials and equipment that have been in satisfactory use at least 2 years.

g. Verification of Dimensions. - The contractor shall be specifically responsible for the coordination and proper relation of his work to the site and to the work of all trades. The contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, shall verify all dimensions in the field, and advise the Contracting Officer of any discrepancy before performing any work.

27-04. MATERIALS. - Materials and equipment shall conform to the respective specifications and other requirements specified herein:

a. Bolts and Nuts. - Federal Specification FF-B-571, commercial steel, zinc-coated, type and size as required.

b. Insulated Wire and Cable. - (1) General. - (a) Except as otherwise specified, all wire and cable for power, control and lighting systems shall be single conductor cables, insulated as specified below with either a heat and moisture-resisting or an ozone-resisting grade of insulation and with heavy duty oil resistant thermosetting synthetic compound (Neoprene) jackets, all conforming to the specific requirements specified below.

(b) The conductor size and circuit operating voltage for any particular application or service shall be as indicated on the drawings.

(2) Materials, construction, and tests, unless otherwise specified, shall conform to the applicable requirements of the IPCEA-NEMA Standards Publication No. WC 3-1959, March 1959, entitled, "Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy". Parts, sections, appendices, grades and classes specified hereinafter will refer to the above IPCEA-NEMA standard, unless otherwise stated.

(3) Conductors shall be of tin or lead alloy coated annealed copper wire conforming to all the applicable requirements of Part 2. Conductors shall be solid or stranded as required below.

(a) Power and Lighting Circuits. - 1. Conductors. - Conductors to be insulated for 1000-volt service and below shall have Class B stranding, and conductors to be insulated for 1001-volt service and greater shall have Class C stranding.

2. Strand shielding conforming to the requirements of Paragraph 2.3.2 shall be applied on all conductors insulated for Rated Circuit Voltage (Phase to Phase) of 2000 volts and greater. The tape shall continuously cover the conductor and shall be firmly bonded to the insulation during vulcanization.

(b) Control Circuits. - Conductors shall have Class B or Class C stranding and shall be not smaller than No. 12 AWG.

(4) Insulation. - (a) Material. - Conductor insulation shall be suitable for conductor temperature of not less than 70°C, and, for conductors specified to be insulated for Rated Circuit Voltage of 600 volts and less, shall be either a vulcanized "Synthetic Rubber Heat and Moisture Resisting" grade of insulation or an "Ozone-Resisting Natural or Synthetic Rubber" grade of insulation; and, for conductors specified to be insulated for a Rated Circuit Voltage of 601 volts and greater, shall be an "Ozone-Resisting Natural or Synthetic Rubber or Butyl Rubber" grade of insulation. The "Ozone-Resisting" grade of insulating compounds shall conform to the requirements of Paragraphs 3.14 or 3.15, except that water absorption characteristics of the Ozone-Resisting Natural or Synthetic Rubber grade of insulation (3.14) shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 4.5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 7 percent higher than the value determined at the end of the initial 24-hour period, nor more than 3 percent higher than at the end of the seventh day.

The "Synthetic Rubber, Heat and Moisture Resisting" grade of insulating shall conform to the requirements of Paragraph 3.13, except that the specific inductive capacity and mechanical water absorption characteristics shall be as follows:

The compound, after a 24-hour immersion, shall show a specific inductive capacity not greater than 5; and, after a continuous 14-day immersion, shall show a specific inductive capacity not more than 10 percent higher than the value determined at the end of the initial 24-hour period, nor more than 3 percent higher than at the end of the seventh day.

The compound, after a 7-day immersion, shall not absorb more than .015 grams of water per square inch of surface exposed to the water.

The manufacturer, in the presence of the Contracting Officer, shall perform tests on samples of the insulation taken from the finished product to determine compliance with the specified requirements. Test procedure shall be in accordance with the applicable requirements of ASTM Standard D470-58T, entitled "Testing Rubber and Thermoplastic Insulated Wire and Cable".

(b) Insulation Thickness. - Thickness of conductor insulation shall be not less than that shown in Part 3, Table 12, Ungrounded neutral, for the respective Rated Circuit Voltages.

(c) Shielding shall be made in accordance with the recommended practice given in Part 4, Table 14, except that single-conductor cables insulated for Rated Circuit Voltage of 3001 and above shall be shielded. The method of accomplishment shall be in accordance with the current practice of the industry.

(5) Jackets. - Over the insulated conductor there shall be applied an outer jacket of an oil-resisting thermosetting synthetic compound conforming to Part 4, Paragraph 4.13.3. Except for shielded wires and cables, the jacket shall be in direct contact and adhere to the conductor insulation. If nonshielded, the jacket thickness shall be as specified in Part 4, Table 26. If shielded, the jacket thickness shall be in accordance with the requirements of Table 28 of the above reference .

(6) Dimensional Tolerance. - The outside diameter of single-conductor wires and cables and multiple-conductor cables shall not vary more than 10 percent and 5 percent, respectively, from the calculated outside diameter based on the thickness, including tolerance, of the component materials specified.

(7) Approval. - Manufacture of the wire or cable shall not be started until all materials to be used in the fabrication of the finished wire or cable have been approved by the Contracting Officer.

(8) Inspection and Tests. - (a) General. - Inspection and tests of wire and cable furnished under these specifications shall be made by and at the plant of the manufacturer, and shall be witnessed by the Contracting Officer, unless waived in writing. All tests and inspections shall conform to the procedure set forth in the applicable specifications or standards referred to herein.

(b) Reports. - Four certified copies of test reports, indicating the results of tests made, shall be furnished the Contracting Officer, and no wire or cable shall be shipped until authorized by the Contracting Officer.

c. Conductors. - Copper-equivalent size indicated on the drawings.

(1) Copper, solid hard-drawn. - Federal Specification QQ-W-336, of size indicated.

d. Conduit. - Rigid steel, Federal Specification WW-C-581.

e. Crossarms. - EEI Specification TD-90 pressure-treated dense or close-grain Douglas fir, or EEI Specification TD-91, pressure-treated dense southern pine, of sizes specified or indicated; pressure treatment shall conform to AWPA C25.

f. Fuses, Power. - NEMA Standard SG 2, and as specified hereinafter.

g. Fuse Cutouts, Primary. - NEMA Standard SG 2 with NEMA Standard 100 mounting brackets where required and as specified hereinafter.

h. Castings. - (1) Cast Iron. - Federal Specification QQ-I-652, class 30.

(2) Cast Steel. - Federal Specification QQ-S-681, class X.

i. Connectors. - Federal Specification W-S-610, and electric power connectors, NEMA Standard SG 1.

j. Ducts. - (1) Asbestos-cement conduit and fittings. - Federal Specification W-C-571. In lieu of the asbestos-cement coupling specified, a fitted plastic or other tough nonmetallic fitted coupling providing a watertight joint may be used.

(2) Bituminized-Fiber Conduit. - Federal Specification W-C-581. In lieu of the fiber coupling specified, a fitted plastic or similar type nonmetallic fitted coupling providing a watertight joint may be used.

(3) Plastic conduit shall be single bore. Conduit and fittings shall be manufactured of materials meeting the chemical and physical requirements specified herein and having the following properties:

Test Method	Property	Value
ASTM D 638	Tensile strength	4,000 p.s.i. minimum
ASTM D 638	Elongation	15 percent minimum
ASTM D 256, Izod notched	Impact Strength	0.8 ft. - lb./in. of notch, minimum
ASTM D 648	Heat distortion 1/2- x 1/2-in. bar	150 degree F. minimum
ASTM D 635	Flammability in./ min., 1/8-in. bar	0.55 in./minute maximum
ASTM D 696	Thermal coefficient expansion in./ in. per degrees F.	6 by 10^{-5} maximum
ASTM D 790	Flexural strength 1/8 in. bar p.s.i.	No Failure

The conduit and fittings shall be free from all substances that injuriously affect any wire or cable covering such as is used on polychloroprene-sheathed cable. The conduit and fittings shall be corrosion-resistant and not adversely affected by chewing insects and drawing rodents or by acids, alkalies, salts, bacteria, and other organic matters that would be encountered in the ground. When tested in accordance with the applicable provisions of ASTM Standard D 543, the conduit and fittings shall meet the following minimum chemical resistance properties:

Reagent	Test temp. (degrees F.)	Test time (hours)	Max. wt. change (percent)	Change in crushing strength (percent)
Sulfuric acid, 0.1 N.	75	72	0.5	± 15
Hydrochloric acid, 0.2 N.	75	72	0.5	± 15
Acetic acid, 5 percent	75	72	0.5	± 15

Conduit and fittings shall be so joined by means of a special plastic solvent welding cement or other approved method as to provide a watertight and rootproof joint. Type I, light-wall conduit, for use with concrete encasement shall have the following minimum wall thickness for the corresponding size shown below:

Wall Thickness (inch)	Conduit Size (inches)
0.090	2
0.100	3
0.110	3-1/2
0.120	4
0.160	5
0.185	6

Sections cut from the conduit shall be calipered for wall thickness. Conduit and fittings shall be free, within commercial tolerances, of objectionable lines, striations, bubbles, welds, and other manufacturing defects that would impair the service of the conduit. The bore of the conduit shall be straight and circular in cross section with smooth interior surfaces free from obstructions and rough or flaky areas. The conduit length for each size shall be the length that is standard with the manufacturer with a permissible tolerance of 1/4 inch per 10-foot length. The plastic conduit shall meet the detail requirements and tests of Federal Specification W-C-581 for the following properties:

Beam strength
Boiling
Crushing strength
Heat resistance
Impact strength
Resistance to flattening
Tightness of joint, except that the joint shall be made up in the approved manner for plastic conduit with solvent welding cement.
Water absorption

Bends, elbows, and other fittings shall be capable of freely passing a ball that is 1/4-inch less in diameter than the nominal bore of the conduit. Fittings shall be of a type especially made for use with plastic conduit for electrical service.

k. Fittings, Cable and Conduit. - Federal Specification W-F-406 or W-F-408.

l. Lamps, Incandescent. - Federal Specification W-L-101.

m. Mortar. - Mortar shall be composed of the following materials:

(1) Aggregate. - Federal Specification SS-A-281b.

(2) Portland Cement. - Federal Specification SS-C-192d.

(3) Water shall be clean, fresh, and free from injurious amounts of mineral and organic substances.

(4) Mixture shall be in the proportions of one part portland cement to one part sand with sufficient water added to produce a pliable and workable mortar.

n. Outlets, Metal for Conduit. - Federal Specification W-C-586.

o. Potheads. - American Institute of Electrical Engineers Standard No. 48.

p. Guy Strand. - A 218; copper-covered steel, American Standard C7.18.

q. Insulators. - American Standards C29.1 through 29.9 inclusive, as applicable and specified hereinafter.

r. Lightning Arresters. - NEMA Standard LA 1, with NEMA Standard mounting bracket where required and as specified hereinafter.

s. Poles. - American Standard 05.1, machine trimmed by turning, pressure-treated in accordance with AWPA Standard C4; creosote conforming to AWPA Standard P1, and oil-borne preservatives and petroleum conforming to AWPA Standards P8 and P9. Pressure treatment of northern white cedar shall be as specified for western red cedar; pressure treatment of western fir and western hemlock shall be as specified for Douglas fir.

t. Pole-Line Hardware. - Zinc-coated, EEI Specifications TD-1 through TD-24, inclusive, except 8, 13, 18, and 20; steel hardware material, ASTM Standard A 107.

u. Solderless Connectors and Splices. - Federal Specification W-S-610, type, class, style, and size as indicated or required.

v. Steel, Structural and Miscellaneous. - ASTM Standard A 7 or A 107.

w. Transformers, Power and Distribution. - NEMA Standard TR 1, American Standards C57.12 and C57.12c, and Federal Specification W-T-631.

x. Wood Preservative for Poles and Crossarms. - AWPA P1, P8, and P9.

y. Zinc Coating for Ferrous Metals. - ASTM Standard A 123 or A 153.

27-05. MATERIALS LIST. - As soon as practicable, and before starting installation of any materials or equipment, the contractor shall submit to the Contracting Officer for approval a complete list, in six copies of materials and equipment to be incorporated in the work. This list shall include manufacturer's style or catalog numbers. Cuts or other descriptive data shall be furnished when required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based on manufacturer's published data, approval of materials and equipment will be tentative subject to submission of complete shop drawings indicating compliance with the contract documents.

27-06. SHOP DRAWINGS. - After receiving tentative approval of the equipment on the material lists and before installation of any of these items, the contractor shall submit complete shop drawings and such other descriptive data as the Contracting Officer may require to demonstrate compliance with the contract documents. Shop drawings shall be submitted for the following items and such other items as the Contracting Officer may direct:

Transformer Pad
Transformers

If departures from the contract drawings are deemed necessary by the contractor, details of such departures, including changes in related portions of the project and the reasons therefor, shall be submitted with the shop drawings. Approved departures shall be made at no additional cost to the Government.

27-07. WORKMANSHIP. - a. General. - All materials and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer to conform with the contract documents. The installation shall be accomplished by workmen skilled in this type of work.

b. Qualification of Cable Splicers. - Before assigning any cable splicer to work covered by this specification, the contractor shall provide the Contracting Officer with the names of the cable splicers to be employed, together with satisfactory proof that each splicer has had at least 3 years experience in splicing high-voltage cables and is experienced with the type and rating of cables to be spliced. In addition, each cable splicer may be required to make an approved dummy splice in the presence of the Contracting Officer in accordance with cable manufacturer's instructions, before the splicer is approved to splice cable covered by this specification. All material for dummy splices shall be furnished by the contractor.

27-08. DUCT SYSTEM. - a. General. - The duct system shall consist of single round-bore conduit. The number and size of the duct shall be as indicated. Duct lines shall be laid to a minimum grade of 4 inches

per 100 feet. Grade may be from one manhole to the next or both ways from a high point between manholes, depending on the contour of the finished grade. Duct lines shall be installed so that the top of concrete in encased duct lines is not less than 18 iches below. Changes in direction of runs exceeding a total of 10 degrees, either vertical or horizontal, shall be accomplished by long swcep bends having a minimum radius of curvature of 25 feet, except that manufactured bends may be used at ends of short runs of 100 feet or less, and then only at or close to the end of the run. The long sweep bends may be made up of one or more curved or straight sections and/or combinations thereof. Manufactured bends shall have a minimum radius of 18 inches for use with ducts of less than 3 inches in diameter and a minimum radius of 36 inches for ducts of 3 inches in diameter and larger. Conduits shall terminate in end bells where duct lines enter manholes. Conduit shall be thoroughly cleaned before using or laying. During construction and after the duct line is completed, the ends of the conduits shall be plugged to prevent water washing mud into the conduits or manholes. Particular care shall be taken to keep the conduits clean of concrete, dirt, and any other substance during the course of construction. Where it is necessary to cut a tapered end on a piece of conduit at the site, the cut shall be made with a tool or lathe designed to cut a taper to match the taper of the particular conduit being used. After the duct line has been completed, a standard flexible mandrel not less than 12 inches long, having a diameter approximately 1/4-inch less than the inside diameter of the conduit, shall be pulled through each conduit, after which a brush with stiff bristles shall be pulled through each conduit to make certain that no particles of earth, sand, or gravel have been left in the line. Pneumatic rodding may be used to draw in the lead wire. Where connection is made to an existing duct that is of different material and shape than the duct line being installed, a suitable coupling of a type recommended by the duct manufacturer shall be used. Conduits shall be stored to avoid warping or deterioration. Plastic conduit shall be stored on a flat surface and protected from the direct rays of the sun. Conduit joints in concrete encasement may be placed side by side horizontally but shall be staggered at least 6 inches vertically.

b. Materials. - (1) Duct Banks shall consist of type I fiber, asbestos-cement, plastic, conduit, at the option of the contractor. The type of conduit shall not be mixed. Cables for the telephone system will be installed by others.

c. Installation of Duct Banks. - (1) Duct banks comprising type 1 single conduits. - (a) General. - Each single conduit of the duct bank shall be completely encased in concrete as indicated on drawings. The thickness of concrete encasement shown on drawings is the minimum thickness, and may be increased to fit the actual shape of the trench. Separators or spacing blocks shall be made of concrete, plastic, or other suitable nonmetallic nondecaying material placed on not greater than 4-foot centers. Joints in conduits shall be staggered at least 6 inches. Ducts shall be securely anchored to prevent movement during the placing of concrete. A bare copper cable not smaller than No. 2/0 AWG shall be installed in each duct bank.

d. Installation of Couplings. - (1) General. - All types of conduit joints shall be made up in accordance with the manufacturer's recommendations for the particular conduit and coupling selected and as approved by the Contracting Officer. In the absence of specific recommendations, the various types of conduit joint couplings shall be made watertight by the following method(s) as appropriate:

(a) Asbestos cement and fiber. - The tapered ends or joints of asbestos cement and fiber, conduit, except where plastic couplings are used, shall be swabbed with bituminous or joint-sealing compound before the coupling is applied, if recommended by the manufacturer to insure a watertight joint. If a plastic or nonmetallic coupling is used, it shall be tightly driven onto the conduit. Due to the brittleness of plastic couplings at low temperatures, such couplings will not be installed when temperatures are below 0 degrees F. The couplings shall be warmed in hot water, or by another approved method when installing in temperatures below 32 degrees F.

(b) Plastic conduit joints shall be made up by brushing a plastic solvent cement on the inside of a plastic coupling fitting and on the outside of the conduit ends. The conduit and fitting shall then be slipped together with a quick one-quarter-turn twist to set the joint tightly.

e. Concrete shall conform to Section "Concrete". Duct lines shall be of monolithic construction. Where a connection is made to an existing duct line, the concrete encasement shall be well bonded or doweled to the existing encasement.

27-09. MANHOLES. - a. General. - Manholes shall be constructed approximately where shown. The exact location of each manhole shall be determined after careful consideration has been given to the location of other utilities, grading and paving. The location of each manhole shall be approved by the Contracting Officer before construction of the manhole is started. Manholes shall be the type noted on the layout drawings and shall be constructed in accordance with the applicable details shown on the drawings. Concrete shall conform to Section, "CONCRETE". Frames and covers shall be made of gray cast iron. A machine-finished seat shall be provided to insure a perfect joint between the frame and cover. Frames and covers shall be delivered on the job unpainted and, after inspection and approval by the Contracting Officer, shall be given two coats of asphalt paint. In paved areas, the top of manhole covers shall be flush with the finished surface of the paving. In unpaved areas, the top of manhole covers shall be approximately 1/2-inch above the finished grade. Where existing grades that are higher than finished grades are encountered, a sufficient number of courses of brick shall be installed between the top of manhole and manhole frame to elevate temporarily the manhole cover to existing grade level. Where duct lines enter manholes, the sections of duct may

be either cast in the concrete or may enter the manhole through a square or rectangular opening of suitable dimensions provided in the manhole walls. Where openings are provided for the entrance of duct lines, the space between ducts and manhole walls shall be calked tight with joint sealing compound, synthetic rubber calking compound.

(1) Joint Sealing Compound. - (a) The entire quantity of sealing compound proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at the source of supply, sufficiently in advance of need to allow 30 days for testing. Sampling and testing will be done by the Government in accordance with referenced specification. The contractor shall provide all required samples. The cost of the first test will be borne by the Government. If the sample fails to meet the specification requirements, the material represented by the sample shall be replaced, and the cost of retesting will be deducted from the payments due the contractor at the rate of $100 per sample retested.

(2) Sealing Compound. - Sealing compound shall conform to Federal Specification TT-S-00227, Class B, color as selected by the Contracting Officer.

(3) Rope Yarn. - Rope yarn shall be the raveled strands of rope fiber free from oil or other staining element.

(4) Preparation. - Grooves in concrete shall be cut and thoroughly cleaned out to a minimum depth and width indicated without damage to adjoining work; however, the depth of joint shall be at least equal to the width, not less than 1/4-inch. Where necessary to provide a suitable backstop, the back of grooves shall be packed tightly with rope yarn or other approved items. All particles of mortar, dust, and other foreign matter shall be brushed out just prior to sealing; all grease, shall be removed and surfaces shall be dry prior to application of calking compound. Primer shall be used as recommended by the manufacturer of the compound.

(5) Sealing Compound. - Sealing compound shall be installed where specified above. The compound shall not be applied when the temperature is under 40°F. Compound shall be applied with open end using open-end type calking gun, using a nozzle of proper size to fit the joint width and shall be forced into grooves with sufficient pressure to expel all air and fill the groove solidly. Application shall begin at bottom and work upward. Compound shall be uniformly smooth and free of wrinkles, and unless otherwise noted, shall be left sufficiently convex to result in a flush joint when dry.

(6) Cleaning. - Equipment shall be cleaned with toluene, tylene or similar solvent.

b. Hardware. - (1) Electric Manholes. - Cables shall be well supported on walls by hot-galvanized cable racks equipped with adjustable hooks and insulators. The number of cable racks indicated shall be installed in each manhole and not less than two spare hooks shall be installed on each cable rack. Insulators shall be made of best-quality, high-glazed porcelain. Insulators will not be required on spare hooks. A cable-pulling iron shall be installed in the wall opposite each duct line entrance into the manhole.

(2) Communications Manholes. - The number of cable racks indicated shall be installed in each telephone manhole. Each cable rack shall be provided with two cable hooks. A cable-pulling iron shall be installed in the wall opposite each duct line entrance into the manhole. Cables for the telephone and communication systems will be installed by others.

c. Ground Rods. - In each electric manhole, at a convenient point close to the wall, a 3/4-inch copper or copper-clad-steel ground rod shall be driven into the earth not less than 6 feet before the manhole floor is poured. The ground rod shall extend approximately 4 inches above the manhole floor.

27-10. PRIMARY CABLE SYSTEM. - a. Rating. - Primary cable system shall consist of neoprene jacketed cable, conforming to Subparagraph "Insulated Wire and Cable". The size and number of conductors and the number of cables shall be as indicated. Cables larger than No. 8 AWG shall be stranded. Cables shall have a voltage rating of at least 15,000 volts, grounded neutral. Primary cable shall be installed in duct lines. Loads shall be divided as evenly as practicable on the various phases of the system.

b. Cable Splicers. - Cable splicers shall be made by qualified cable splicers in strict accordance with the recommendations of the cable manufacturer. A copy of the manufacturer's recommendations shall be furnished to and approved by the Contracting Officer. Splices in neoprene-jacketed cable shall provide insulation and jacket equal in every respect to that of the cable. In order to prevent the possibility of moisture entering between the insulation and jacket, preparation for splices in neoprene jacketed cable shall include cutting the jacket back sufficiently to provide at least 1 inch of exposed conductor insulation between the sleeve connector and the tapered end of the neoprene jacket. In splicing neoprene jacketed cable, special care shall be taken to insure that all wax is removed from the section to be covered with splicing tape. Shielding tape shall be applied to splices in shielded cables as required to continue the shielding through the entire splice. Unless otherwise indicated, primary cable shall terminate in potheads of proper characteristics for the system. In filling potheads at cable terminals, the cable manufacturer's recommendations shall be carefully followed in order to insure the use of a compound that will not injure the cable insulation or jacket.

c. Installation of Cable. - (1) In duct lines. - Cable splices shall be made in the manholes only. Each circuit shall be identified by means of nonferrous-metal or fiber tags or approved equal, in each manhole, and at each terminal.

27-11. POLES. - Poles shall be pressure-treated wood: southern pine, Douglas fir, ponderosa pine, jack pine, lodgepole pine, red pine, western fir, western hemlock, western red cedar, or northern white cedar at the option of the contractor. Poles shall be of the length and class indicated, except that longer poles shall be provided where necessary to maintain the minimum vertical clearances required by the National Electrical Safety Code after final unloaded sagging. All clearances specified by the National Electrical Safety Code shall be maintained. Footnote reductions to tables shall not apply and clearances shall not be reduced except where authorized in writing by the Contracting Officer. Pole markings shall be located approximately 10 feet from the butt of the pole, except where other locations standard with the pole manufacturer are approved. Poles shall be turned smooth full length, and shall be roofed, gained, and bored prior to pressure treatment. Sweeps and short crooks of poles in line shall not exceed 50 percent of the maximum permitted by the applicable American Standard.

27-12. STORAGE AND HANDLING OF POLES. - Poles held in storage for more than 2 weeks shall be stored in accordance with American Standards. The handling of poles shall be in accordance with American Standards except that pointed tools capable of producing indentations more than 1-inch in depth shall not be used.

27-13. POLE SETTING. - In normal firm ground, minimum pole-setting depth shall be 5'-0" below grade. In rocky or swampy ground, pole-setting depths shall be respectively decreased or increased in accordance with local power company, as published standards and as approved by the Contracting Officer. In swampy ground, a bog shoe may be used. Poles in straight runs shall be in a straight line. Curved poles shall be placed with the curvature in line with the lead. Poles shall be set to maintain as even a grade as practicable. When the average ground run is level, consecutive poles shall not vary more than 5 feet in height. When the ground is uneven, poles differing in length shall be kept to a minimum by locating poles to avoid the highest and lowest ground points. If it becomes necessary to shorten a pole, a piece shall be sawed off the top end. If poles are shortened after treatment, the shortened end of the pole shall be given an application of hot preservative. Where poles are set on hilly terrain, along the edge of cuts or embankments, or where the soil may be washed out, special precautions shall be taken to ensure durable foundations, and the setting depth shall be measured from the lower side of the pole. Holes shall be dug large enough to permit the proper use of tampers to the full depth of the hole. Earth shall be thrown into the hole in 6-inch maximum layers, then thoroughly tamped before the next layer is thrown in. Surplus earth shall be placed around the pole in a conical shape and packed tightly to drain water away from the pole.

27-14. CROSSARMS. - Crossarms shall conform to details shown on drawings. Climbing space, wire clearances, and vertical and longitudinal strength of crossarms shall conform to the National Electrical Safety Code. Crossarms shall be straight and free of twists to within 1/10 inch per foot of length. Bend or twist shall be in one direction only. Crossarms shall be machined, chamfered, trimmed, and bored for all pins and bolts required before pressure treatment. Double crossarms shall be provided at dead ends, at angles, and corners and elsewhere as required to provide adequate vertical and longitudinal strength. Double crossarms shall be securely held in position by means of 1/2-inch double-arming bolts. Each double-arming bolt shall be equipped with four nuts and four square washers. Crossarms shall be bolted to poles with 5/8-inch through-bolts with square washers at each end. Bolts shall extend not less than 1/8 inch through bolts with square washers at each end. Bolts shall extend not less than 1/8 inch nor more than [redacted] inches beyond the nut.

27-15. CROSSARM BRACES. - Crossarm braces shall be provided on all crossarms and shall be zinc-coated structural steel in conformance with ASTM Standard A 7 or A 107. Flat braces shall be 1/4-inch by 1-1/4 inches, not less than 28 inches long. Flat braces shall be bolted to arms with 3/8-inch carriage bolts with round washer between bolthead and crossarm, and secured to poles with 1/2- by 4-inch lag screws after crossarms are leveled and alined.

27-16. PINS. - a. Metal pins shall be zinc-coated forged steel with lead thread height to suit the insulator provided, but not less than 4-1/2 inches high by 5/8-inch diameter. Shoulder shall be not less than 2-inch diameter, designed to distribute load uniformly to the crossarm. Shank shall be not less than 5/8-inch diameter by 5-3/4 inch length, equipped with 2-inch square washer, nut, and locknut, and shall project not less than 1/8-inch nor more than 2 inches beyond locknut.

27-17. INSULATORS. - a. General. - Insulators for use on primary distribution system shall conform to the American Standards Nos. C29.2, C29.4, C29.5, C29.6, or C29.7, as applicable for the installation, with testing in accordance with ASA Standard C29.1. Suspension-type insulators shall be used on the primary system at corners and angles, for suspended buses, at dead ends, and wherever else pins do not provide adequate strength. Mechanical strength of suspension and strain insulators shall exceed the ultimate strength of the conductor or guy attached thereto. Insulators for various uses shall have ratings not lower than the classes indicated in Table 2:

TABLE 2

Minimum rating of insulators in terms of class

Service	Pin	Line Post	Suspension	Guy Strain
15,000V. and below	55-5	57-1LO11S	52-4	54-2

27-18. GUYS. - Guys shall be provided at the locations, with leads and strengths indicated on the drawings, and elsewhere as required wherever conductor tensions are not balanced, as at angles, corners, dead ends, and in conformity with the National Electrical Safety Code H30. Guys shall be as shown on drawings. Where guys are wrapped around poles, at least two guy hooks shall be provided and pole shims shall be provided where guy tension exceeds 6,000 pounds. Three bolts or offset-type guy clamps or approved guy grips shall be provided at each guy terminal. Anchors shall be rock anchors when installed in rock, installed at right angles to the guy; elsewhere anchors shall be of an approved expanding type. All guy anchors and attachments shall provide a strength exceeding the required guy strength. Thimbles or thimble-eyes shall be provided on all anchor rod and eye-bolt guy attachments to protect the strand. An approved half-round steel guy protector, not less than 8 feet long, shall be provided at the anchor of each guy, securely clamped to the guy or anchor at bottom and top. When field conditions prevent the indicated guy lead, anchors shall be placed in a location approved by the Contracting Officer, and the guy strength increased by the ratio of the sine of the lead angle indicated to the sine of the lead angle provided, except that the lead angle shall be not less than 15 degrees. Guy strand shall be 7 strand, class 30 HS or 30-EHS copper-covered steel, with a breaking strength not less than 6,000 pounds.

27-19. LINE CONDUCTORS. - Line conductors for primary shall be bare hard-drawn copper of the sizes indicated on the drawings. Splices under tension shall be mechanically and electrically secure with a strength not less than the conductor. Splice materials, sleeves, fittings, and connectors shall be noncorrosive and shall not adversely affect the conductor with which they are used. Conductors shall be tied to insulators in an approved manner. Tie wires for copper conductors shall be soft-drawn copper No. 8 for No.6 line conductors, No. 6 for No. 4 and No. 2 line conductors. All dead ends shall be made with approved clamps designed for the purpose, with a strength not less than the conductor. Care shall be taken in handling and stringing of conductors to guard against cuts, scratches, and kinks. Conductors shall not be drawn over rough or rock ground, nor around sharp bends. When drawn by machine power, conductors shall be drawn from the mounted-reel through approved stringing sheaves in approximately straight lines and clear of all obstructions. A climbing space at least 48 inches square shall be provided. Initial stringing sags and tensions shall be as indicated, or in accordance with approved tables for the conductor furnished by the contractor, provided indicated clearances are maintained.

27-20. POTHEADS. - Potheads shall be the hermetically sealed capnut type and shall be suitable for conductors of the gage and type used. Potheads for three conductor cables shall have cast iron bells or bodies. Bell caps or lids of multiple conductor and bodies of single-conductor potheads may be cast iron for cables up to 250 MCM or 250 amperes,

and shall be cast brass or aluminum or other nonmagnetic metal for cables larger than 250 MCM or 250 amperes. Insulators shall be made of glazed wet-process electrical porcelain of the indoor or outdoor type as required. Cable-entrance sealing fittings shall be positive-sealed stuffing boxes for nonleaded cables, for single-conductor cables. Potheads shall be properly filled with insulating compound which shall be heated and poured at the correct temperature insured by the use of a thermometer, all as recommended by the pothead manufacturer. Pothead voltage ratings shall be 15,000 volts. The standard Withstand-Test Voltages of the assembled potheads shall conform to AIEE Standard No. 48.

27-21. POLE-LINE HARDWARE. - Pole-line hardware shall be hot-dip-galvanized. Suitable washers shall be installed under bolt heads and nuts on wood surfaces. Washers used on through-bolts and double-arming bolts shall be approximately 2-1/4 inches square and 3/16-inch thick. The diameter of holes in washers shall be the correct standard size for the bolts on which the washers are used. Washers for use under the heads of carriage bolts shall be of proper size to fit over the square shank of the bolt. Eyebolts, bolt eyes, eyenuts, strain-load plates, lag screws, guy clamps, fasteners, hooks, shims, and clevises shall be used wherever required to adequately support and protect the poles, crossarms, guy wires, and insulators.

27-22. LIGHTNING ARRESTERS. - Lightning arresters shall be provided at all aerial-to-underground connections, and transformers. Selection of arrester ratings and classification according to use shall be as described by NEMA LA 1. Arresters shall be equipped with suitable mounting brackets for the applicable method of mounting. Arresters shall be connected by means of a soft-drawn-copper conductor, not lighter than No. 6 AWG, to a copper or copper-clad-steel ground rod not less than 3/4-inch in diameter, or its equivalent. The ground rod shall be driven at least 8 feet into the ground approximately 3 feet out from the base of the pole. After installation is completed, the top of the ground rod shall be approximately 1 foot below finished grade. The total ground resistance shall not exceed 25 ohms. Ground resistance shall be measured in normally dry conditions not less than 48 hours after rainfall. The ground conductor shall be protected by half-round wood, plastic, or fiber molding from the ground line to a point at least 8 feet above the ground line and throughout the communication and transformer spaces. The wood plastic or fiber molding shall be stapled to the pole at intervals not exceeding 2 feet, with one staple not more than 3 inches from each end. Single-point serrated staples of a type suitable for use with the plastic or fiber molding shall be used for stapling molding to the pole. Where ground conductor is not covered by molding, it shall be stapled to the pole at intervals not exceeding 2 feet. All connections shall be made with solderless connectors except where solder-type lugs are furnished on the equipment.

27-23. DISTRIBUTION TRANSFORMERS. - Distribution transformers shall be of the type I, mineral-oil-insulated, two winding type, and in accordance with the requirements hereinafter stated. Transformers shall be suitable in every

respect for outdoor installation and rated as indicated. Power and distribution transformers shall be products of a manufacturer who has produced units of the same type, rating and voltage as required for this project, within the 2-year period preceding the date of the invitation for bids, which have operated satisfactorily for at least 1 year prior to date of the invitation for bids. Evidence showing such production and satisfactory performance and proved reliability of the product shall be promptly submitted to the Contracting Officer upon request therefor. All transformers shall be provided with rated kv.-a. NEMA standard taps. Where taps are not required under the NEMA standards, transformers shall have two 2-1/2 percent rated kv.-a. high-voltage taps above and below rated primary voltage. High-voltage bushings shall be of the tank-wall type. The high-voltage winding of each transformer shall be given a production-line-impulse test. The production-line-impulse test and detection means shall meet the following minimum requirements: (a) one full-wave test at American Standard wave shape and at a voltage magnitude not less than that specified for the specific voltage class in American Standard C57.12, table 12-02. 110a, column 7, for distribution levels, and (b) detection shall be made by observation of an oscilloscope or by means of automatic electronic circuits, provided sufficient data are available on essentially duplicate transformers to show that the circuits are sufficiently sensitive to detect impulse failures within the windings. In lieu of the preceding tests, the contractor may elect a substitute standard impulse test procedure in accordance with American Standard C57.12-06.215 using detection methods as given in American Standard C57.12-92.600; however, if this election is made, tests shall be conducted on one transformer of each group of six or less transformers of the same rating being furnished under this contract. The high-voltage winding of each transformer rated above 167 kv.-a. shall be impulse tested in conformance with NEMA Standard TR 1. Prior to final acceptance of the transformers by the Contracting Officer, the contractor shall submit for approval the manufacturer's or a recognized independent testing laboratory's test reports in duplicate, similar to those covered in NEMA Standard TR 1, and as required above. The average sound level in decibels of the transformers for indoor installations shall be guaranteed not to exceed the values given in Table III of NEMA Standard TR 1. Transformer tank shall have a standard gray finish. Transformer installations shall include one primary fuse cutout and one lightning arrestor for each ungrounded phase conductor. All accessories for each installation shall conform to the applicable NEMA standards and shall be suitable in every respect for the intended service. Each transformer shall have its kv.-a. rating conspicuously displayed on its tank.

a. Fence-Enclosed Concrete Mat. - Transformers shall be mounted on a fence-enclosed concrete mat. Mat select gravel and crushed stone shall be provided as indicated. Fence shall be of the chain-link type and shall conform to requirements covering "Chain Link Fencing 7 Feet" as specified in Section, MISCELLANEOUS WORK. An entrance gate with catch and padlock shall be provided in the fence where indicated

on the drawings or where directed by the Contracting Officer. Porcelain-enameled steel or approved equal, high-voltage-warning signs shall be fastened to each side of the fence, approximately 5 feet above the ground.

27-24. PRIMARY-FUSE CUTOUTS. - Primary-fuse cutouts shall be heavy duty, porcelain-enclosed indicating non-dropout type, rated 7.8 k.v. Fuse ratings shall be equal to approximately 150 percent of the transformer full-load rating, or shall be as indicated on the drawings and coordinated to the transformers provided.

27-25. SECONDARY CABLE SYSTEM. - Secondary cable system shall consist of 600-volt neoprene-jacketed cable, as specified under "Insulated Wire and Cable". The size and number of conductors and the number of cables shall be as indicated. Conductors larger than No. 8 AWG shall be stranded. Each circuit shall be identified by means of fiber or nonferrous-metal tags, or approved equal, in each manhole, each junction box, and at each terminal. Secondary cable shall be installed in conduit. Top of conduit shall be at least 2 feet below finished grade.

a. Cable Splices. - Cable splices shall be made in strict accordance with the cable manufacturer's recommendations. A copy of the manufacturer's recommendations shall be furnished to the Contracting Officer for inspection purposes. Splices in neoprene jacketed cable shall provide insulation and jacket equal in every respect to that of the cable. In order to prevent the possibility of moisture entering between the insulation and the jacket, preparation for splices in neoprene-jacketed cable shall include cutting the jacket back sufficiently to provide at least 1 inch of exposed conductor insulation between the sleeve connector and the tapered end of the polychloroprene jacket. In splicing neoprene-jacketed cable, special care shall be taken to insure that all wax is removed from the section of cable jacket to be covered with splicing tape.

b. Service Connections to Buildings. - Service cables shall be extended into the various buildings as indicated, and shall be properly connected to the main service equipment.

27-26. GROUNDING. - Grounding shall conform to applicable requirements in the National Electrical Code, the National Electrical Safety Code, or herein. Neutral conductors, metallic conduits, pothead bodies, junction boxes, lightning arresters, fence enclosures, and all non-current-carrying metallic parts of equipment, shall be grounded.

a. Manhole Grounding. - Cable racks installed in the electrical-distribution-system manholes shall be properly connected to the No. 2/0 continuous grounding conductor by means of No. 4 AWG uninsulated stranded copper cable. Connection to ground cable shall be by means of bolted-clamp terminals or approved molded fusion-weld process. The ground wire shall be neatly and firmly attached to the manhole walls.

b. Transformer-Station Grounding. - Transformer-station grounding shall be as indicated on drawings. A bare copper cable not smaller than No. 2/0 AWG shall be installed not less than 24 inches below grade connecting to the equipment, and the fence. Fence and equipment connections shall not be smaller than No. 2/0 AWG. Ground connections shall be made by solderless lugs, or shall be welded by an approved molded fusion process.

c. Building Grounding - A bare copper cable not smaller than No. 2/0 AWG shall be installed in each service conduit and shall connect to the continuous grounding cable in the manholes. Non-current-carrying metal parts of electric equipment shall be effectively grounded by connection to the bus. The ground bus shall be connected to the lighting system neutral, 2/0 continuous grounding-cable and water-service. Ground conductors shall be copper wire, cable, or bus bar of the type and size as indicated, or as required by National Electrical Code. Ground conductors shall be installed in a neat and workmanlike manner and shall be securely held in place by means of straps placed at proper intervals. Connections and splices in the grounding system shall be made by means of solderless connectors, except where solder-type lugs are furnished on equipment.

d. Lightning-Arrester Grounding Conductors. - Lightning-arrester grounding conductors shall be bonded to the No. 2/0 AWG continuous grounding cable. Ground conductors shall be not smaller than No. 2/0 AWG for distribution-class arresters. Ground connections shall be made with solderless connectors or approved molded fusion-weld process. When the installation is complete and all grounding "groups" are bonded together the complete system should measure no more than 15 ohms. If this value cannot be reached the Contracting Officer shall be contacted for further instructions. Additional ground rods shall be used, in the area of the riser pole, if required to establish an effective ground and payment for these additional rods will be made under Item "Miscellaneous Metals".

27-27. CONNECTIONS BETWEEN AERIAL AND UNDERGROUND SECTIONS. - Where the system changes from aerial to underground, the underground cable shall be extended up the pole in rigid conduit, to the crossarm and shall terminate in single-conductor capnut-type outdoor potheads, as shown on drawing.

27-28. CONNECTION TO UTILITY LINES. - The contractor shall coordinate the work with the Huntington Electric Light Company and shall provide for final connection to the lines of the power company at no additional cost to the Government.

27-29. BRIDGE LIGHTS. - Bridge lighting units on aluminum standards shall be furnished and installed on the bridges or at the entrances thereto as shown on the drawings.

27-30. CONCRETE. - Concrete work shall conform to the requirements of Section CONCRETE.

27-31. TESTS. - a. Operating Test. - After the installation has been completed, and at such time as the Contracting Officer may direct, the contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this section of the specifications. The test shall be performed in the presence of the Contracting Officer. The contractor shall furnish the necessary instruments and personnel required for the test, and the Government will furnish the necessary electric power.

b. Ground-Resistance Measurements. - Ground-resistance measurements of each group of ground rods shall be taken and certified by the contractor to the Contracting Officer. The contractor shall submit in writing to the Contracting Officer upon completion of the project, the measured ground resistance of each ground rod and grounding system, indicating the location of the rod and grounding system, as well as the resistance and soil conditions at the time the measurements were made. When the building water service is used as a ground or part of the grounding system, ground-resistance measurements shall also be made of this connection. Ground-resistance measurements shall be made in normally dry weather, not less than 48 hours after rainfall, and with the ground under test isolated from other grounds.

c. Factory Test Reports. - Factory test reports on equipment, including the impulse tests specified for transformers, shall be certified by the manufacturer or testing laboratory and furnished by the contractor to the Contracting Officer.

27-32. GUARANTY. - The following equipment furnished under this section of the specifications shall be guaranteed in accordance with the guaranty provisions of the SPECIAL CONDITIONS:

Cable and wire, 5,000 volts and above
Lightning arresters
Primary fuse cutouts
Potheads
Bridge lights
Transformers

27-33. PAYMENT. - No separate payment will be made for the work covered under this section, and all costs in connection therewith, including concrete, cement, reinforcement steel, and transformer pen shall be included in the lump-sum contract price for Item No. 87, "Exterior Electrical Work".

SECTION 28

STRUCTURAL STEEL BRIDGES
(Items 75 and 76)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
28-01	General	28-1
28-02	Materials and Workmanship	28-1
	a. General	28-1
	b. Structural Steel	28-1
	c. Shear Connectors	28-1
	d. Bridge Bearing Pads	28-1
	e. Miscellaneous	28-2
28-04	Design	28-2
28-05	Workmanship	28-2
	a. Connections	28-2
	b. Holes	28-2
	c. Nuts	28-2
28-06	Erection	28-3
	a. Driftpins	28-3
	b. Gas Cutting Torch	28-3
	c. Preparation of Bearing Area	28-3
28-07	Painting	28-3
28-08	Payment	28-3

SECTION 28

STRUCTURAL STEEL BRIDGES
(Items 75 and 76)

28-01. GENERAL. - The steel for the Service and Access Bridges, complete, with structural steel shapes, steel bearings, plates, expansion plates, bars, shear connectors, and all necessary welding, and other fastenings, shall be constructed in accordance with these specifications and with details, sizes, and dimensions and at the locations shown on the drawings.

28-02. MATERIALS AND WORKMANSHIP. - a. General. - Materials shall conform to the applicable requirements indicated in this paragraph and the workmanship to Section 31 and as further specified in this paragraph. Fabrication, delivery, storage and erection shall conform to the current specifications "Standard Specification for Highway Bridges" of the American Association of State Highway Officials, and to the "Standard Specifications for Welded Highway and Railway Bridges" of the American Welding Society, except as otherwise noted on the drawings or specified.

(1) The contractor shall furnish, without extra cost to the Government, two certified copies of all mill reports covering the chemical and physical properties of the steel used in the work under this specification.

(2) Substitutes of sections, or modifications of details, or both, shall be made only when approved by the Contracting Officer.

(3) The contractor alone shall be responsible for all errors of fabrication and for the correct fitting of the structural members shown on the shop drawings.

b. Structural Steel. - Structural steel shall be welding type structural steel and shall conform to the requirements of Paragraph 30-02.

c. Shear Connectors. - Studs shall have solid or granular flux filled ends and shall conform to ASTM Designation A-108-58T, and AISI 1020 Cold Drawn Steel. Studs shall be fastened to plate by end welding in the shop or the field using an approved stud welding gun. No paint shall be applied to any surface of the shear connectors or to the upper surface of the plate to which it is to be welded.

d. Bridge Bearing Pads. - Bridge bearing pads, similar and approved equal to Fabreeka Products Company bridge masonry plate pads or Johns-Manville #600 Bridge Bearing Pad, thickness as indicated.

e. Miscellaneous. - Miscellaneous items shall conform to applicable requirements of Section 30.

28-03. INSPECTION AND TESTS. - The material to be furnished under this specification shall be subject to inspection and tests in the mill, shop, and field by the Government inspectors. Inspection and tests will be conducted without expense to the contractor, however, inspection in the mill or shop shall not relieve the contractor of his responsibility to furnish satisfactory materials, and the Government reserves the right to reject any material at any time before final acceptance of the structure when, in the opinion of the Contracting Officer, the materials and workmanship do not conform to the specification requirements.

24-04. DESIGN. - a. The design of members and connections for any portions of the structure not indicated on the design drawings shall be completed by the fabricator. Shop drawings shall be submitted in accordance with the SPECIAL CONDITIONS. Such design shall conform to the requirements of the current issue of the Standard Specification for Highway Bridges of the American Association of State Highway Officials. Drawings showing such designs, comparable in extent of information and detail to those issued by the Contracting Officer, shall be submitted for approval before any material is fabricated. Subsequent to approval by the Contracting Officer, no changes or modifications shall be made without his consent.

b. Shop drawings will not be submitted nor fabrication commenced for the Access Bridge until the rock excavation for the spillway channel has been completed and has been inspected and approval given by the Contracting Officer, in writing, prior to preparation of shop drawings and fabrication. In the event there is any variation in the rock surface in the vicinity of the bridge abutments, from that indicated on the drawings, the Contracting Officer will determine if any redesign is necessary. In the event redesign of the bridge is required, such redesign will be performed by the Government, and an equitable adjustment will be made to the contract price for Item No. 76 due to the required changes.

28-05. WORKMANSHIP. - a. Connections. - Connections shall be welded as shown on the drawings, except where bolting is indicated.

b. Holes. - Holes shall not be made or enlarged by burning, nor will the burning of unfair holes in the shop or field be acceptable. Holes in base or bearing plates shall be drilled. Holes shall be provided in members to permit connecting the work of other trades who will furnish the necessary templates or such information as may be required.

c. Nuts. - Nuts shall be of an approved self-locking type, or the bolt threads shall be upset to prevent backing off of the nuts.

28-06. ERECTION. - a. Driftpins. - Driftpins may be used only to bring together the several parts; they shall not be used in such manner as to distort or damage the metal.

b. Gas Cutting Torch. - The use of a gas cutting torch in the field for correcting fabrication errors will not be permitted for major member in the structural framing. Its use will be permitted on minor members when the member is not under stress, and then only after specific approval has been obtained.

c. Preparation of Bearing Area. - Bearings shall be set in exact position and shall have a full and even bearing upon the concrete work of the supporting structure. Bridge seats which are improperly finished, deformed or irregular within the bearing area of the bridge pads shall be corrected before the pads are placed.

28-07. PAINTING. - All structural steel and castings, unless otherwise noted on the drawings or specified, shall be painted as specified in Section, PAINTING, of these specifications. Structural steel and connectors to be encased in concrete shall not be painted.

28-08. PAYMENT. - Payment for furnishing, installing, and erecting the access and service bridge superstructures will be made at the applicable lump sum contract prices for Item 76, "Structural Steel - Access Bridge", and Item 75, "Structural Steel - Service Bridge"; prices shall include the cost of all shapes, bearing plates, shoes, connectors, anchors, bolts, and expansion plates. Pavement drains will be measured and paid for under Item No. 73 "Miscellaneous Metals". Railings will be measured and paid as under Item No. 77, "Aluminum". Structural steel in expansion joints, including sections anchored in part to the intake tower and piers and abutments shall be furnished and paid for under the applicable items for "Structural Steel", for access and service bridges. Bridge lights and light posts will be included under Item 87 "Electrical Work, Exterior."

SECTION 29

MISCELLANEOUS METAL ITEMS
(Items 73, 74, and 77)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
29-01	Scope	29-1
29-02	General	29-1
29-03	Shop Drawings and Samples	29-1
29-04	Metal Fasteners and Anchor Bolts	29-1
29-05	Miscellaneous Structural Steel Items	29-1
29-06	Steel Guards	29-2
29-07	Steel Pipe Railings	29-2
	a. Fabrication	29-2
	b. Anchorage	29-2
	c. Removable Sections	29-2
29-08	Wrought Iron Pipe Railings	29-3
29-09	Chain and Attachments	29-3
29-10	Steel Stairs	29-3
29-11	Steel Ladders	29-3
29-12	Checkered Steel Plates and Frames	29-3
29-13	Metal Gratings and Frames	29-3
29-14	Safety Treads	29-3
29-15	Aluminum	29-3
	a. General	29-3
	b. Materials	29-4
	c. Workmanship	29-4
	d. Installation	29-4

Paragraph No.	Paragraph Title	Page No.
29-16	Painting	29-4
29-17	Payment	29-4
	a. Aluminum	29-4
	b. Miscellaneous Metals	29-4
	c. Structural Steel - Miscellaneous	29-5

SECTION 29

MISCELLANEOUS METAL ITEMS
(Items 73, 74, and 77)

29-01. SCOPE. - This section covers the furnishing and installation of miscellaneous metal items not covered in other sections of the specifications.

29-02. GENERAL. - a. Materials and workmanship, except as otherwise specified under this section, shall conform to the applicable requirements of Sections 30 and 31. Shop drawings shall be submitted for all specified items, for all shop fabricated metal items and as required to complement the contract drawing details. Items furnished, unless otherwise specified or indicated on the drawings shall be standard manufacturer's products fabricated in accordance with the best shop methods. The contractor shall verify all measurements and shall take all field measurements necessary before fabrication. Items indicated to be galvanized shall be hot-dip galvanized after fabrication. All exposed fastenings shall be of the same material, color and finish as the metal to which it is applied, unless otherwise shown or specified. Material shall be free from defects, and of the best commercial quality. Supplementary parts customarily necessary to complete each item though such part is not definitely shown or specified, shall be included.

b. All ferrous metal items exposed to the weather and exterior to structures such as gratings, floor plates, manhole covers, and frames shall be galvanized. Interior metal items, except as specifically specified, need not be galvanized except that all wrought iron pipe railings and wrought iron rungs and all pull bars shall be galvanized.

29-03. SHOP DRAWINGS AND SAMPLES. - a. Shop drawings for all parts of the work hereinafter designated shall be submitted to the Contracting Officer for approval in accordance with paragraph entitled Shop Drawings of Part II, SPECIAL CONDITIONS. Drawings shall indicate thickness of metal, all dimensions, construction details, reinforcement and anchorage.

b. Samples of all metal fasteners and anchors shall be submitted for approval.

29-04. METAL FASTENERS AND ANCHOR BOLTS.- All metal fasteners and anchor bolts except those specified elsewhere to be furnished for and set with parts included in other sections of these specifications, shall be provided hereunder where necessary and required for completion of the work.

29-05. MISCELLANEOUS STRUCTURAL STEEL ITEMS. - All miscellaneous structural steel items such as steel access covers, bars, angles, pull bars, lifting eyes, and plates shall conform either to ASTM Standard 27

or A-36-60T or Federal Specification QQ-S-741a, Type I. Welding quality steel shall be provided where required.

29-06. STEEL GUARDS. - Where indicated, steel guard for door and other openings shall be protected with structural steel members anchored in the concrete with welded steel straps.

29-07. STEEL PIPE RAILINGS. - Pipe rails shall be steel pipe conforming to Federal Specifciation WW-P-406a, except that bend sections shall conform to Federal Specification WW-P-404a. Pipe shall be of size and weight indicated. All pipe railing, except within structures, shall be hot-dip galvanized after fabrication.

a. Fabrication. - Jointing of post rail and corners shall be as follows.

(1) Mitered and welded type joints made by fitting post to top rail and intermediate rail to post, mitering corners, groove welding joints and grinding smooth. Railing splices shall be butted and reinforced by a tight-fitting interior sleeve not less than 6 inches long.

(2) Railings may be bent at corners in lieu of mitering and welding or using fittings, provided all such bends are made in suitable jigs and that the cylindrical cross section of the pipe he maintained through the entire bending.

b. Anchorage. - Unless otherwise shown on the drawings, pipe railing shall be anchored as specified below.

(1) Where shown, installation of posts on concrete, shall be provided with pipe sleeve inserts, size as shown and shall be set and anchored in the concrete. Posts shall be inserted in sleeves, leveled, plumbed, and calked solid with molten lead or lead wool. Anchorage joint shall be covered with pipe collar pinned to post. Ends of rails shall be secured by means of standard steel pipe flange anchored to masonry or concrete walls with expansion bolts, toggle bolts, or cinch anchors.

(2) Where indicated, posts shall be set in standard steel pipe floor flange securely anchored to concrete with expansion bolts.

(3) For steel stairs, railing shall be anchored to steel channel stringers as detailed.

c. Removable Sections. - Removable sections shall be furnished as indicated on the drawings.

29-08. WROUGHT IRON PIPE RAILINGS. - Wrought iron pipe railings shall conform to the applicable requirements of Paragraph 29-07 and to the requirements detailed on the plans.

29-09. CHAIN AND ATTACHMENTS. - Chains shall conform to Federal Specification RR-C-271a with Am-1, Type I, Grade C, Class 4. Types of attachments shall be as required for a complete installation, including spring snaps and forged steel eye bolts.

29-10. STEEL STAIRS. - Ships ladder shall be fabricated and erected where shown.

29-11. STEEL LADDERS. - Steel ladders shall be of the bar and rung type, constructed of structural steel in accordance with the details and the following minimum requirements. Stringers shall be a minimum 3/8-inch by 2-1/2-inch mild steel bars fitted with anchor lugs for securing to concrete as indicated. Rungs shall be 3/4-inch minimum round, solid section steel rods, fitted into punched holes in stringers, welded and ground smooth. Ladders shall be secured at each end and at intermediate points as indicated.

29-12. CHECKERED STEEL PLATES AND FRAMES. - Frames shall be all welded construction of standard steel shapes with anchors for concrete. Frame construction shall be such that tops of frames and cover plates will finish flush with floor. Covers shall be standard checkered steel plates conforming to Federal Specification QQ-F-461, Type II. Weights and thicknesses of metal shall be as detailed and steel other than checkered steel plates shall conform to Federal Specification QQ-S-741a or ASTM A7-58T or A36-60T. All sharp edges and burrs shall be removed from cover units and exposed edges.

29-13. METAL GRATINGS AND FRAMES. - Metal gratings shall conform to the requirements of Federal Specification RR-G-661, Type I. Edges of all gratings shall be banded, and all gratings shall be hot galvanized to conform to Federal Specification QQ-S-775a, Class C. Frames shall be of standard steel angles and shall be all-welded construction, and galvanized to match grating. Frames shall be provided with welded-on anchors.

29-14. SAFETY TREADS. - Where indicated, concrete stair treads and landings shall have metal safety treads size as shown. Treads shall be installed and anchored in accordance with the manufacturer's instructions.

29-15. ALUMINUM. - a. General. - All aluminum work, except aluminum letters, and all necessary bolts and fastenings, and other items as called for on the drawings shall be furnished and installed under Item "Aluminum".

b. Materials. - (1) Bridge railings shall be similar and approved equal to types indicated on the drawings.

(2) Pipe for pipe railings shall conform to ASTM Specification B241-59T, alloy 6061, Temper T6. Hatch covers, angle frames, and other items of structural aluminum shall conform to Federal Specifications QQ-A-270a, Alloy 6061, Temper T6, or QQ-A-327b, Temper T6, as applicable. Rivet and bolts shall be structural aluminum alloy conforming to 6061-T6.

c. Workmanship. - Materials and workmanship shall conform to the applicable requirements of "Specifications for Structures of Aluminum Alloy 6061-T6", Second Progress Report of the Committee of the Structural Division on Design in Lightweight Structural Alloys, of the American Society of Civil Engineers.

d. Installation. - The railings and other items shall be installed in a first class, workmanlike manner. Anchor bolts, grating, fasteners, washers, and all parts or devices necessary for proper installation, whether or not fully detailed on the drawings, shall be furnished and placed by the contractor. Where aluminum is secured to concrete work, corrosion resisting steel anchors shall be used. All nuts, screws, and other fastening devices shall be tight. No materials shall be used which will react on aluminum. Hatch covers shall be fabricated and installed complete with hinges and handles. No welding will be permitted except as indicated. Painting will not be required.

29-16. PAINTING. - Surfaces of miscellaneous metal items embedded in concrete shall not be painted. Surfaces of all other items specified herein shall be painted in accordance with section entitled, PAINTING.

29-17. PAYMENT. - a. Aluminum. - Unless elsewhere specified to be included under other payment items, measurement and payment for all aluminum as called for on the drawings will be made under Item No. 77, "Aluminum". The contract unit price per pound of aluminum shall include the cost of furnishing (including non-aluminum items as required) and installing all materials in accordance with the drawings and the specifications.

b. Miscellaneous Metals. - Unless elsewhere specified to be included under other payment items, all miscellaneous metals as called for on the drawings will be made at the contract price per pound for Item No. 73, "Miscellaneous Metals". Items to be paid for under miscellaneous metals include steel and wrought iron pipe railings and rungs, pull bars, stair treads, chains, inserts, and such items so identified for payment on the plans. The contract price per pound shall include the cost of furnishing and installing all accessories and attachments in accordance with the drawings and specifications.

c. Structural Steel - Miscellaneous. - Unless elsewhere specified to be included under other payment items, all miscellaneous structural steel items as called for on the drawings will be made at the contract price per pound for Item No. 74, "Structural Steel - Miscellaneous". Miscellaneous structural steel items to be paid for include steel stairs and ladders, crane rail supports, and frames and anchors at openings (except doors), and hatchway covers and gratings. The contract price per pound shall include furnishing and installing of all required attachments.

SECTION 30

METALS, MISCELLANEOUS MATERIALS
AND STANDARD ARTICLES
(Index)

Paragraph No.	Paragraph Title	Page No.
30-01	Standard Specifications	30-1
30-02	Structural Steel	30-1
30-03	Steel, Concrete Reinforcement	30-2
30-04	Steel Forgings	30-2
30-05	Steel Castings	30-2
30-06	Steel Bolts and Nuts	30-2
30-07	Aluminum	30-2
30-08	Corrosion-Resisting Steel Pins and Bolts	30-2
30-09	Hot-Roller Steel, For Shafting, Sleeves, and Rollers	30-2
30-10	Bronze	30-2
	a. Castings	30-2
	b. Manganese Bronze Castings	30-2
	c. Rolled Manganese Bronze and Manganese Bronze Forgings	30-2
30-11	Brass	30-2
	a. Sheets, Plates and Bars	30-2
	b. Castings	30-2
	c. Naval Brass	30-3
30-12	Copper	30-3
30-13	Sheet Lead	30-3
30-14	Zinc	30-3
30-15	Babbitt Metal	30-3
30-16	Safety Treads	30-3

Paragraph No.	Paragraph Title	Page No.
30-17	Steel Floor Grating	30-3
30-18	Steel Floor Plates	30-3
30-19	Non-Metallic Waterstops	30-3
30-20	Rubber Gate Seals	30-3
30-21	Joint Sealing Compound	30-4
30-22	Iron Castings, Gray	30-4
30-23	Malleable Iron Castings	30-4
30-24	Malleable Iron Fittings	30-4
30-25	Sheet Iron	30-4
30-26	Solder	30-4
30-27	Brass Pipe and Fittings	30-5
30-28	Copper Tubing	30-5
30-29	Valves	30-5
30-30	Chain and Attachments	30-5
30-31	Steel Pipe	30-5
30-32	Wrought Iron Pipe	30-5
30-33	Wrought Iron Shapes	30-5
30-34	Payment	30-5

SECTION 30

METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES

30-01. STANDARD SPECIFICATIONS. - a. Standard specifications of the following listed authorities whenever cited herein are referred to by use of the abbreviations shown below:

NAME	ABBREVIATION
Federal Specifications	Fed. Spec.
Military Specifications	MIL or JAN
U. S. Army Engineer Waterways Experiment Station P. O. Box 631, Vicksburg, Mississippi	CRD-C
American Society for Testing Materials 1916 Race Street Philadelphia 3, Pennsylvania	ASTM

b. Reference copies of specifications published by agencies of the Department of Defense are on file in the Office of the Contracting Officer, and may be viewed by interested parties upon request. Copies of Fed. Specs. may be obtained at nominal cost by writing to the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Copies of the specifications of other listed authorities may be purchased by writing directly to such organizations at the addresses shown above.

c. In the paragraphs below, each metal, miscellaneous material or standard article is followed by the number and title of the specifications, to which the items is required to conform.

30-02. STRUCTURAL STEEL. - a. Federal Specification QQ-S-741a, "Steel Plates, Shapes and Bars, Carbon, Structural", Type I or II (as specified or as shown on the drawings), Class 1. Wherever Type I steel is required, Type II steel will also be acceptable.

b. Requirements in Federal Specification QQ-S-741a, paragraph 3.6 for identification marking are waived for Type I structural steel. Identification marking of type will be required whenever Type II steel is required except when certified mill reports are furnished, in which case requirements for such marking will be waived.

c. The contractor may at his option furnish steel conforming to ASTM A7-58T, Specifications for "Steel for Bridges and Buildings" when steel conforming to QQ-S-741a, Type I, is indicated or specified; or also he may at his option furnish steel conforming to ASTM A373-58T, Specifications for "Structural Steel for Welding" when steel conforming to QQ-S-741a, Type II, is specified or indicated.

d. The contractor may at his option furnish steel conforming to ASTM A36-60T in lieu of steel conforming to Federal Specification QQ-S-741a, Types I and II. Identification marking of type will be required whenever steel conforming to ASTM A36-60T is provided except when certified mill reports are furnished, in which case requirements for such marking will be waived.

30-03. STEEL, CONCRETE REINFORCEMENT. - Specified and included under Section "Concrete".

30-04. STEEL FORGINGS. - ASTM A235-55, Specifications for "Carbon Steel Forgings for General Industrial Use", Class as required.

30-05. STEEL CASTINGS. - Federal Specification QQ-S-681b, "Steel; Castings", Class 2.

30-06. STEEL BOLTS AND NUTS. - Bolts - Fed. Spec. FF-B-575b; Nuts - Fed. Spec FF-N-836. Unless otherwise specified, steel for bolts shall be Grade 1 and for nuts shall be Grade A.

30-07. ALUMINUM. - See Section 29.

30-08. CORROSION-RESISTING STEEL PINS AND BOLTS. - Corrosion-resisting steel bolts, studs, nuts, washers, bars and shapes shall conform to Federal Specification QQ-S-763b, "Steel Bars, Shapes, and Forgings, Corrosion-Resisting Steel", Condition A, Class 304, and to the applicable requirements of Paragraph, "STEEL BOLTS" above.

30-09. HOT-ROLLER STEEL, FOR SHAFTING, SLEEVES, AND ROLLERS. - ASTM Designation A 107-52aT for "Hot-Rolled Carbon-Steel Bars".

30-10. BRONZE. - a. Castings. - Federal Specification QQ-L-225, "Leaded Tin Bronze Castings and High Leaded Tin Bronze Castings", Composition 6.

b. Manganese Bronze Castings. - Federal Specification QQ-B-726c, "Bronze, Manganese and Aluminum-Manganese, Castings".

c. Rolled Manganese Bronze and Manganese Bronze Forgings. - Federal Specification QQ-M-80, "Manganese Bronze Bars, Plates, Rods, Sheets, Strips, Flat Wire, Forgings, and Structural and Special Shaped Sections", Class A, temper half hard.

30-11. BRASS. - a. Sheets, Plates and Bars. - Federal Specification QQ-B-613a, "Brass, (Copper-Zinc Alloy), Leaded and Non-leaded; Plate, Rolled Bar, Sheet and Strip", Composition and Temper as required.

b. Castings. - Federal Specification QQ-B-621b, "Brass; Castings, Leaded Yellow", Composition B.

c. Naval Brass. - Federal Specification QQ-N-35, "Naval Brass; Rods, Bars, Wire, Shapes and Forgings and Flat Products with Finished Edges". All brass shall be of this material except as otherwise specified.

30-12. COPPER. - Federal Specification QQ-C-576a, "Copper Plates, Rolled Bars, Sheets, and Strips", Temper as required.

30-13. SHEET LEAD. - Federal Specification QQ-L-201d, "Lead; Sheet", Grade B.

30-14. ZINC. - Federal Specification QQ-Z-351a, "Zinc, Slab (Spelter)", Type III.

30-15. BABBITT METAL. - Federal Specification QQ-T-390, "Tin Alloy Ingots and Castings and Lead Alloy Ingots and Castings (Antifriction Metal) for Bearing Applications", Grade 3.

30-16. SAFETY TREADS. - Federal Specification RR-T-661, "Treads; Safety, Metallic", Type B, Class 6, size as indicated.

30-17. STEEL FLOOR GRATING. - Federal Specification RR-G-661a, Type I, galvanized edges shall be bonded. Fasteners shall be of an approved type.

30-18. STEEL FLOOR PLATES. - Checkered steel plates shall be standard plates conforming to Federal Specification QQ-F-461, Type II. Weights and thicknesses of metal shall be as detailed. Plates other than checkered steel plates shall conform to Federal Specification QQ-S-741a or ASTM A 7 or A 36.

30-19. NON-METALLIC WATERSTOPS. - Waterstops may be composed of natural rubber, a suitable synthetic rubber, a blend of natural and synthetic rubber, or of polyvinylchloride. Rubber waterstops shall comply with the requirements of CRD-C-513-60, "Corps of Engineers Specifications for Rubber Waterstops". Polyvinylchloride waterstops shall conform to the requirements of CRD-C-572-60A, "Corps of Engineers Specifications for Polyvinylchloride Waterstops".

30-20. RUBBER GATE SEALS. - The material for gate seals shall be compounded of natural rubber containing only carbon black, zinc oxide, accelerators, vulcanizing agents, antioxidants, copper inhibitors and plasticizers. Physical characteristics shall meet the following requirements:

Physical Test	Test Value	Test Method Specification
Tensile Strength	2500 p.s.i. (min)	Fed. Std. 601, Method No. 4111
Elongation at break	450% (min)	Fed. Std. 601, Method No. 4121
300% Modulus	900 p.s.i. (min)	Fed. Std. 601, Method No. 4131
Durometer Hardness Shore Type A	60 to 70	Fed. Std. 601, Method No. 3021
Water Absorption	5% by weight (max)	Fed. Std. 601, Method No. 6631
Compression Set	30% (max)	Fed. Std. 601, Method No. 3311
Tensile Strength after aging	80% (min) of tensile strength	Fed. Std. 601, Method No. 7111 Oxygen bomb method
Adhesion on 18 ounce cotton farbic	18 lbs. per inch (min)	Fed. Std. 601, Method No. 8011 or 8021

30-21. JOINT SEALING COMPOUND. - Sealing compound shall conform to Federal Specification TT-S-00227, Class B, self-curing color as selected by the Contracting Officer to match contiguous concrete. Rope yarn used for backstops shall be the raveled strands of rope fiber free from oil or other staining element.

a. The entire quantity of sealing compound proposed for use shall be stored on the project site in sealed and labeled containers, or segregated at the source of supply, sufficiently in advance of need to allow 30 days for testing. Sampling and testing will be done by the Government in accordance with referenced specification. The contractor shall provide all required samples. The cost of the first test will be borne by the Government. If the sample fails to meet the specification requirements, the material represented by the sample shall be replaced, and the cost of retesting will be deducted from the payments due the contractor at the rate of $100 per sample retested.

30-22. IRON CASTINGS, GRAY. - Federal Specification QQ-I-652a, for "Iron Castings, Gray", class as indicated or specified. Tensile tests and chemical analysis will not be required.

30-23. MALLEABLE IRON CASTINGS. - Federal Specification QQ-I-666c, "Iron Castings, Malleable", Class A.

30-24. MALLEABLE IRON FITTINGS. - Federal Specification WW-P-521b, for "Pipe Fittings; Malleable-Iron (Screwed), 150-pound".

30-25. SHEET IRON. - Federal Specification QQ-S-775a, for "Steel Sheets, Zinc-Coated" and QQ-S-636, for "Steel; Carbon (low carbon) sheets and strips", as applicable.

30-26. SOLDER. - Federal Specification QQ-S-571c, "Composition SN50".

30-27. BRASS PIPE AND FITTINGS. - Federal Specification WW-P-351, for "Pipe; Brass, Seamless, Iron-Pipe Size, Standard and Extra Strong", Grade A, and WW-P-460, for "Pipe-Fittings; Bronze (screwed), 125-and 250-pound", class as required.

30-28. COPPER TUBING. - Federal Specification WW-T-799a, for "Tubing; Copper, Seamless (for use with Solder Joint or Flared-Tube Fittings)".

30-29. VALVES. - Federal Specification WW-V-51a, for "Valves, Bronze, Angle, Check, and Globe 125- and 150-pound, Screwed and Flanged (for Land Use)". WW-V-54, for "Valves, Bronze, Gate; 125- and 150-pound, Screwed and Flanged (for Land Use)". WW-V-58, for "Valves, Cast-Iron, Gate; 125- and 250-pound, Screwed and Flanged (for Land Use)", as applicable.

30-30. CHAIN AND ATTACHMENTS. - Federal Specification RR-C-271, "Chain and Attachment; Standard, Miscellaneous". Chain shall be Type I, Grade C, Class 4, unless otherwise indicated on the drawings. Types and classes of attachments and accessories shall be as called for on the drawings.

30-31. STEEL PIPE. - (including black steel pipe). - Federal Specification WW-P-406, "Pipe; Steel and Ferrous Alloy (for) Ordinary Uses (Iron-Pipe Size), class A or B and galvanized if so indicated on the drawings.

30-32. WROUGHT IRON PIPE. - Federal Specification WW-P-441b, class A or B and galvanized if so indicated on the drawings.

30-33. WROUGHT IRON SHAPES. - Federal Specification QQ-I-686b, Grade B, galvanized, if indicated.

30-34. PAYMENT. - No separate payment will be made for the work, materials, or supplies covered in this section of the specifications and all costs in connection therewith shall be included in the applicable contract prices for the items or structure involved.

SECTION 31

METALWORK FABRICATION, MACHINE WORK AND MISCELLANEOUS PROVISIONS

(INDEX)

Paragraph No.	Paragraph Title	Page No.
31-01	Scope	31-1
31-02	Workmanship	31-1
	a. General	31-1
	b. Dimensional Tolerances for Structural Work	31-1
31-03	Welding	31-1
	a. General	31-1
	b. Inspection	31-2
	c. Welding Equipment	31-2
	d. Filler Metal	31-2
	e. Special Workmanship Requirements	31-3
31-04	Flame Cutting	31-4
31-05	Riveting	31-5
	a. Rivet Holes	31-5
	b. Rivets and Driving	31-5
31-06	Bolted Connections	31-6
	a. Bolt Holes	31-6
	b. Bolts and Nuts	31-6
	c. Washers	31-6
	d. Special Bolted Connections	31-6
	e. High-Strength Bolting	31-7
31-07	Machine Work	31-7
	a. General	31-7
	b. Finished Surfaces	31-7
	c. Unfinished Surfaces	31-8
	d. Keys and Keyways	31-8
	e. Pine Holes	31-8

Paragraph No.	Paragraph Title	Page No.
	f. Gears	31-8
	g. Shafting	31-8
	h. Bearings	31-9
	i. Protection of Machined Surfaces	31-9
	j. Lubrication	31-9
31-08	Steel W 11 Armoring and Protection Angles	31-9
31-09	Metallic Coatings	31-10
	a. Zinc Coatings	31-10
	b. Castings	31-10
31-11	Patterns	31-10
31-12	Lists of Materials	31-11
31-13	Shop Assembly	31-11
31-14	Field Assembly	31-11
	a. General	31-11
	b. Alignment and Setting	31-12
	c. Blocking and Wedges	31-12
	d. Foundations and Groutings	31-12
31-15	Tests and Trials	31-12
	a. General	31-12
	b. Analysis of Material	31-12
	c. X-Ray and Gamma-Ray Tests	31-12
31-16	Measurement and Payment	31-13
	a. Measurement	31-13
	b. Payments	31-14
	c. Partial Payment	31-14

SECTION 31

METALWORK FABRICATION, MACHINE WORK AND MISCELLANEOUS PROVISIONS

31-01. SCOPE. - This section specifies the workmanship standards applicable to the various phases of metalwork fabrication, the methods and precautions for erection of metal structures and machines, the general requirements for tests and trials on such structures and machines to insure conformance with the specifications, and miscellaneous requirements incidental to the work.

31-02. WORKMANSHIP. - a. General. - Material shall be thoroughly straightened by methods that will not result in injury, except that sharp kinks or bends in members to be straightened will be cause for rejection. Finished members shall be free from kinks, bends, or winds. Shearing shall be accurately done, and all portions of the work neatly finished. Corners shall be square and true unless otherwise shown on the drawings. Re-entrant cuts shall be made in a workmanlike manner and, where they cannot be made by shearing, a rectangular punch may be used. Re-entrant cuts shall be filleted unless otherwise approved by the Contracting Officer. Bends, except for minor details, shall be made by approved dies or bending rolls. Where heating is required, precautions shall be taken to avoid overheating the metal and it shall be allowed to cool in such a manner as not to destroy the original properties of the metal. Steel with welds will not be accepted, except where welding is definitely specified, called for on the drawings, or otherwise approved. All bolts, nuts, and screws shall be tight. The ends of pipe, except for handrailing, shall be reamed.

b. Dimensional Tolerances for Structural Work. - (1) Dimensions shall be measured by means of an approved calibrated steel tape of the same temperature as the structure at the time of measurement. Unfairness of platework shall be held to a practicable minimum.

(2) An allowable variation of 1/32-inch is permissible in the over-all length of members with both ends milled. Members without milled ends, which are to be assembled to other steel parts of the structure, shall not deviate from the dimensions shown on the drawings by more than 1/16-inch for members 30 feet or less in length, and by not more than 1/8-inch for members over 30 feet in length.

31-03. WELDING. - a. General. - Unless otherwise authorized or specified, welding shall be by electric arc-welding process, using a method which excludes the atmosphere from the molten metal. Welding, unless specified otherwise, shall conform to the applicable provisions of the current AWS "Specification for Welded Highway and Railway Bridges". Welding operators, including tack welders and machine welders,

and machines shall be qualified, and as necessary requalified, for the particular type of work to be done, as required by the American Welding Society "Tentative Standard Qualification Procedure", the U. S. Navy Department "General Specifications for Inspection of Material", Appendix VII, "Welding", the U. S. Coast Guard "Marine Engineering Regulations and Material Specifications", or by Section IX of the "ASME Boiler and Pressure Vessel Code". The contractor shall certify by name, to the Contracting Officer, the welding operators so qualified, and the code under which qualified. The contractor shall require any welder to repeat the qualifying tests when, in the opinion of the Contracting Officer, the work of the welder indicates a reasonable doubt as to his efficiency. In such cases, the welder shall be recertified, as above, if he successfully passes the retest; otherwise he shall be disqualified until he has successfully passed a retest. Welding, except light caulk welding, will not be permitted in combination with riveting in the same joint. All expenses in connection with qualification and requalification shall be borne by the contractor.

b. Inspection. - Welding shall be subject to inspection by Government inspectors in conformance with the applicable inspection requirements of paragraph 31-03a. The Contracting Officer may also require coupons to be cut from any location in any joint for testing. All sections of welds found defective shall be chipped or cut out to base metal and properly rewelded before proceeding with the work. Should any two coupons cut from the work of any welder show strengths, under tests, less than that of the base metal, it will be considered evidence of negligence or incompetence and such welder shall be permanently removed from the work. When coupons are removed from any part of a structure, the members cut shall be repaired, at the expense of the contractor, in a neat and workmanlike manner with joints of proper type to develop the full strength of the members and joints cut, with peening as necessary or directed to relieve residual stress.

c. Welding Equipment. - Manual and automatic arc-welding machines and equipment may be of either the alternating current or direct current type and shall conform to the requirements for arc-welding equipment as set forth in the AWS "Specification for Welded Highway and Railway Bridges".

d. Filler Metal. - (1) Unless otherwise specified or authorized, all deposited weld metal shall have elastic limits and ultimate tensile strengths not less than those specified for the respective base metals welded; shall have an elongation in 2 inches, using annealed samples, of at least 95 percent of the value specified for the base metal or at least 75 percent using unannealed samples; chemical composition similar to that of the base metal and, when subjected to approved tests, shall have corrosion resistance at least equivalent to that of the base metals.

These properties shall be determined by testing in accordance with the applicable provisions of the AWS specifications, or as otherwise approved by the Contracting Officer.

(2) Welding electrodes and rods shall be of a type and grade approved by the Contracting Officer of such chemical composition and physical properties as will produce the characteristics specified above; and so adapted to the base metal and thickness of parts to be welded as will insure effective penetration and an intimate uniform fusion of the filler and base metals, in all welding positions and under all conditions to be encountered, without undercutting or overlapping. The electrodes shall conform to applicable provisions of the ASTM specifications.

e. Special Workmanship Requirements. - (1) Welding Procedure. - The contractor shall prepare a schedule of welding procedure for each structure to be welded, including any stress-relief annealing, and shall submit the schedules for approval in accordance with the requirements of SC-4, "Shop Drawings". The procedures shall be in accordance with the best modern welding practice, and shall be such as to minimize residual stresses and distortion of the finished members of the structure. Should it be found that changes in any previously approved welding procedure are desirable, the Contracting Officer will direct or authorize the contractor to make such changes. Approval of any procedure, however, will not relieve the contractor of the sole responsibility for producing a finished structure meeting all requirements of these specifications.

(2) Stress-Relief Annealing. - Where stress-relief annealing is specified or required on the drawings, it shall be in accordance with the requirements of paragraph 512 of the AWS "Specification for Welded Highway and Railway Bridges", unless otherwise authorized or directed by the Contracting Officer.

(3) Welds. - Assembly of all welded joints before welding shall be such as to secure specified root openings. The maximum length of bead laid in any one continuous or skip pass shall be that which can be laid with one electrode. Unless otherwise specifically authorized, all welds shall be of the type, size, and dimensions as shown on the drawings. Welds 3/8-inch and larger shall be made in not less than 2 passes and, unless otherwise specified or authorized, shall be made with one pass for each 3/16-inch of the maximum thickness of the weld metal, exclusive of back bead. Welds for watertight work shall be continuous and made in not less than 2 passes for butt joints and for at least one fillet weld of "Tee" joints and lap joints. In all welding, the application of the first pass shall be given special attention to insure satisfactory penetration and fusion of the filler and base metals. Preheating, root-chipping, and peening shall be utilized where directed to assure the soundness

of highly important or heavily stressed connections and to relieve heavy residual stresses. Wherever practicable, peening shall be done by pneumatic tools. Unless otherwise directed, the first and last beads of welded connection shall not be peened. The "housing" of welded connections by "returning" or "boxing" shall be employed as required, in accordance with approved welding practice.

(4) Assembling Devices and Temporary Connections. - Preparatory to welding, the assembled elements of members shall be held rigidly in position by the use of approved devices adapted to the purpose, and capable of exerting pressures requisite to remove local distortions and press the parts into intimate contact except where root openings are required. Bolts may be used for temporary connections provided that the bolt holes are subsequently filled in an approved manner, with sound weld metal and ground flush with adjacent base metal, unless otherwise authorized. Welding for temporary connections and bracing will be permitted provided that, where such welded connections do not form a part of a later permanent connection, such weld metal shall be removed, where so directed, approximately flush with adjacent base metal and in no case shall depressions be left in the finished work.

(5) Preheating. - Preheating shall be performed where specified or otherwise required. The weldments to be preheated shall be slowly and uniformly heated by approved means to the prescribed temperature, held at that temperature until the welding is completed and then permitted to cool slowly in still air.

(6) Welding of Steel Castings. - Castings shall be chipped, machined or ground to sound base metal at any surfaces which will be incorporated into welded connections. Major connections, designed for transfer of stresses, shall not be welded if the temperature of the casting is lower than 100 degrees F. Castings containing over 0.35 percent and up to 0.45 percent carbon or over 0.75 percent manganese, except Classes 1 and 2 (Fed. Spec. QQ-S-681b) shall be preheated to a temperature not to exceed 450 degrees F. and welding shall be accomplished while the castings are maintained at a temperature above 350 degrees F. Welding will not be permitted on castings containing carbon in excess of 0.45 percent, except on written authorization of the Contracting Officer.

31-04. FLAME CUTTING. - Low-carbon structural steel may be cut by machine-guided or hand-guided torches instead of by shears or saws. Flame cutting of material other than low-carbon structural steel shall be subject to approval and where proposed shall be definitely indicated on shop drawings submitted to the Contracting Officer. Where a torch is mechanically guided, no chipping or grinding will be required except as necessary to remove slag and sharp edges. Where a torch is hand guided, all cuts shall be chipped, ground, or machined

to sound metal except where material is not to be welded, in which case burrs and rough edges only shall be removed. Where the torch is mechanically guided, flame gouging will be permitted in preparation for welding.

31-05. RIVETING. - a. Rivet Holes. - (1) General. - Rivet holes, except those in lateral, longitudinal, and sway-bracing which may be punched full size, shall be subpunched or subdrilled at least 1/8-inch smaller than the nominal size of the rivet and then reamed to a diameter not more than 1/16-inch greater than the nominal diameter of the rivet, unless otherwise specified or authorized. The thickness of the material in punched work shall not be greater than the nominal diameter of the rivet, plus 1/8-inch. Material of greater thickness shall be drilled. For shop riveting, if the parts to be riveted are welded, bolted, or clamped together before drilling of rivet holes, the holes may be drilled full size. The accuracy of workmanship of holes punched or drilled full size shall be such that for any group of contiguous holes in the same plane when assembled, 75 percent shall admit a rod equal to the nominal diameter of the cold rivet at right angles to the plane of the connection. When holes for field connections are required to be subpunched, and the work is assembled and match-marked in the shop, the holes shall be reamed in the shop. Subpunched work not assembled in the shop shall be reamed in the field after the work has been assembled and bolted together. Where reaming is not required, the diameter of the punch shall be not more than 1/16-inch greater than the diameter of the rivet; nor shall the diameter of the die opening be more than 1/16-inch greater than the diameter of the punch. Punching shall be accurately done. Drifting to enlarge unfair holes will not be allowed and poor matching of holes will be cause for rejection. For slight mismatching, reaming to a larger diameter for the next standard size of rivet may be allowed. Holes shall be accurately spaced, cylindrical, and perpendicular to the member. Countersinking shall be true and square with the hole.

(2) Reaming and Drilling. - Reaming and final drilling shall be done with the component parts of the member assembled and firmly clamped together. Drilling shall be done with twist drills. Reaming shall be done with short taper reamers having not less than four (4) flutes. Reamed holes shall be smooth, showing that the reamers have touched the entire circumference. Outside burrs on reamed holes shall be removed to the extent of making a 1/16-inch chamfer. The accuracy of workmanship of holes required to be reamed or drilled after assembly shall be such that at least 75 percent of any group of contiguous holes in the same plane shall show no offset greater than 1/32-inch between adjacent thicknesses of metal.

b. Rivets and Driving. - Riveted members shall have all parts well pinned and firmly drawn together with bolts before riveting

is commenced. Unless otherwise specified or authorized by the Contracting Officer, rivets shall be of the same type of material as the members they are used to connect. The size of the rivets specified or required indicates the nominal size of the cold rivets before heating. Rivets shall be heated uniformly to a light cherry red color in a gas, oil, or electric furnace so constructed that it can be adjusted to the proper temperature, except that a coal or coke furnace of approved type may be used for heating field rivets. When heated and ready for driving rivets shall be practically free from slag, scale, and adhesive materials. Rivets shall be hot driven with pressure tools. When driven, rivets shall completely fill the holes. Rivet heads shall be neatly formed with dies of approved shape, and shall be full size, concentric with the rivet hole, and in full contact with the member. Loose, burned, badly formed, or otherwise defective rivets shall be removed and replaced, care being exercised to avoid injury to adjacent metal. Recupping or caulking will not be permitted. Unless otherwise specified or authorized, all countersunk rivet heads shall be chipped or ground flush with the surface of the plate. Field rivets shall not be painted until they have been inspected and accepted.

31-06. BOLTED CONNECTIONS. - a. Bolt Holes. - Holes for unfinished bolts shall be not more than 1/16-inch larger than the nominal diameter of the bolts. Unless otherwise specified or shown on the drawings, holes for turned bolts shall be not more than 0.020 inches larger than the nominal diameter of the bolt. Where the thickness of the material is greater than the nominal diameter of the bolt, holes for unfinished bolts shall be sub-punched and reamed or sub-drilled and reamed or drilled from the solid. Holes for turned bolts shall be truly cylindrical throughout and drilling or reaming shall be done after the parts to be connected are assembled. Poor matching of holes shall be cause for rejection.

b. Bolts and Nuts. - Bolts and nuts shall conform to the applicable provisions of Federal Specifications FF-B-575b and FF-N-836a. Turned bolts shall have Type 3 heads and Group B, Type 3, Style 3-5 and nuts. The body diameter shall have a tolerance of plus 0.000 inches and minus 0.006 inches on the nominal diameter. The finished shank shall be long enough to provide full bearing, and washers shall be used under the nuts to provide full grip when the nuts are tightened.

c. Washers. - Plain washers shall conform to the requirements of ASA B27.2-1958 for "Plain Washers", heavy series and lock washers shall conform to the requirements of ASA B27.1-1958 for "Lock Washers", heavy series. Washers shall be provided for applications specified elsewhere and where indicated on the drawings.

d. Special Bolted Connections. - Where turned bolts with closer fits than specified above are required, the bolts shall have

a nominal body diameter at least 1/16-inch larger than the nominal diameter of the threaded portion and the body length shall be 1/16- to 1/8-inch greater than the combined thickness of the connected members unless otherwise indicated on the drawings. Threads shall be Class 3 fit. Holes shall be as specified or indicated on the drawings. Plain washers shall be provided.

e. High-Strength Bolting. - High-strength bolting shall conform to the AISC Specification for Structural Joints using ASTM A 325 Bolts.

31-07. MACHINE WORK. - a. General. - Unless otherwise shown on the shop drawings, all tolerances, allowances, and gages for metal fits shall conform to ASA Standard B4.1-1955, "Preferred Limits and Fits for Cylindrical Parts", for the class of fit as shown or otherwise required. In general, tolerances for surfaces designated by non-decimal dimensions shall be within 1/64-inch. Sufficient machining stock shall be allowed on placing pads to insure true surfaces of solid material. Finished contact or bearing surfaces shall be true and exact to secure full contact. Journal surfaces shall be polished and all surfaces shall be finished with sufficient smoothness and accuracy to insure proper operation when assembled. Parts entering any machine shall be carefully and accurately machined and all like parts shall be interchangeable. All drilled holes for bolts shall be accurately located.

b. Finished Surfaces.- Where the type of surface is indicated on the drawings or specified herein, the finish shall be the corresponding type, as defined below. Where the type of finish is not indicated or specified, the finish shall be that type, as defined below, which is most suitable for the part to which it applies and shall be consistent with the class fit required. Surfaces to be machine finished shall be indicated on the shop drawings by symbols which will show the type of finish to be provided.

(1) For a "rough" finish, pronounced tool marks will be allowed on the surface and slight depressions not affecting the strength or utility of the part will not be cause for rejection. The surface may be produced by rough planing, turning, grinding, sawing, machine-guided flame cutting, or similar operations. In general, a "rough" finish will be required on surfaces which are to be machined to dimension where liberal tolerances will be permitted.

(2) For an "average" finish, a surface true to dimensions will be required; such as may be produced by medium smooth planing, turning, sawing, grinding, or similar operations. Only minor tool marks will be permitted. In general, an "average" finish will be required for stationary mating surfaces where reasonably accurate positioning of the members or a moderately tight joint is desired.

(3) For a "smooth" finish, a surface practically free of tool marks will be required, such as may be produced by smooth planing, turning, milling, grinding, drilling, reaming, or similar methods of machining. Pronounced tool marks or other defects on such surfaces will be cause for rejection. In general, a "smooth" finish will be required on surfaces in sliding or rotating contact when motion is slow and loads are light.

(4) For a "fine" finish, the surface shall be machined to close dimensional tolerances by fine turning, boring, milling, reaming, grinding, medium buffing, burnishing, or similar methods. In general, a "fine" finish will be required on surfaces in sliding or rotating contact when loads and speeds are moderate.

(5) For a "polish" finish, the member shall present a very smooth surface such as may be produced by very fine surface or cylindrical grinding, smooth buffing, coarse honing, coarse lapping, hand finishing with fine emery cloth or other comparable methods. In general, a "polish" finish will be required on surfaces in sliding or rotating contact where loads are heavy or motion is rapid.

c. Unfinished Surfaces. - So far as practicable, all work shall be laid out to secure proper matching of adjoining unfinished surfaces. Where there is a large discrepancy between adjoining unfinished surfaces, they shall be chipped and ground smooth, or machined, to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on the drawings and shall be chipped or ground free of all projections and rough spots. Depressions or holes not affecting the strength or usefulness of the parts may be filled in a manner approved by the Contracting Officer.

d. Keys and Keyways. - Keys and keyways shall conform to the requirements of ASA Standard B 17.1-1943 for "Shafting and Stock Keys", unless otherwise specified or required.

e. Pin Holes. - Pin holes shall be bored true to gages, smooth and straight, and at right angles to the axis of the member. The boring shall be done after the member is securely fastened in position.

f. Gears. - Unless otherwise specified or shown on the drawings, all gears shall have standard involute teeth, machine cut from the solid rim. Standard cycloidal teeth may be substituted in lieu of involute teeth upon the approval of the Contracting Officer.

g. Shafting. - Unless otherwise specified or authorized, all shafting shall be turned or ground steel shafting conforming to the requirements of ASTM A107-59T. Fillets shall be provided where

changes in section occur. Cold-finished shafting to the requirements of ASTM A108-58T, may be used, where keyseating is the only machine work required.

h. Bearings. - Unless otherwise specified or shown on the drawings, bearings may be lined with babbitt or bronze. Where the bearing pressure is in excess of 200 pounds per square inch, they shall be lined with bronze. Unless otherwise required or authorized, pressures on lined bearings shall not exceed 1000 pounds per square inch of projected area. Anti-friction bearings of approved types and of sizes not less than those recommended by the bearing manufacturer for the duty may be permitted at the discretion of the Contracting Officer. All bearings shall be properly aligned and provided with a suitable means for lubrication. Anti-friction bearings shall be so installed as to provide for retention of the lubricant and to exclude dirt and grit.

i. Protection of Machined Surfaces. - (1) Machine-finished surfaces shall be thoroughly cleaned of foreign matter. Finished surfaces of large parts and other surfaces shall be protected with wooden pads or other suitable means. Unassembled pins and bolts shall be oiled and wrapped with moisture resistant paper or protected by other approved means.

(2) Finished surfaces of ferrous metals to be in bolted contact shall be washed with a rust inhibitor and given one thin coat of white or blue lead and tung oil.

(3) Finished surfaces of ferrous metals which will be exposed after installation shall be painted as specified in Section, PAINTING.

j. Lubrication. - The arrangement and details for lubrication are shown on the drawings or otherwise specified. Before erection or assembly, all bearing surfaces shall be thoroughly cleaned and lubricated with approved high grade oil. After assembly, all lubricating systems shall be filled with the lubricant specified.

31-08. STEEL WALL ARMORING AND PROTECTION ANGLES. - Steel wall armoring and protection angles required for the protection of concrete work shall be erected true to line and grade within the tolerances specified below. The edges of exposed faces may have a vertical or horizontal distortion from a straight line not greater than .025 inch per foot of length; provided, that distortion for any single piece shall not exceed 1/4-inch; and provided, that when the warp is greater than 1/16-inch an extra anchorhole shall be drilled near the proper corner and the piece drawn into position thereby. All bolt heads on the exposed face shall be countersunk and fitted or ground, so that the

heads are flush with the finished surface. Joints between abutting sections shall be square and flush and the butting ends shall be sawed or otherwise made smooth and regular.

31-09. METALLIC COATINGS. - a. Zinc Coatings. - Zinc coatings shall be applied in a manner and of a thickness and quality conforming to ASTM specification A123-47.

b. Repair of Zinc Coatings. - All zinc coatings that have been damaged in handling or transporting or in welding, installing or bolting shall be repaired by the application of a thick paste made from galvanizing repair compound conforming to Federal Specification O-G-93 and water. Covers to be repaired shall be cleaned thoroughly, including removal of slag on welds, before the paste is applied. Surfaces to be coated with paste shall be heated with a torch so that all metallics in the paste will be melted when applied to the heated surface. Extreme care shall be taken to see that adjacent zinc-coated surfaces are not damaged by torch. Molten metal shall be spread uniformly over all surfaces to be coated and the excess metal wiped off.

31-10. CASTINGS AND FORGINGS. - a. General. - Each casting shall have the mark number cast upon it. Each casting shall have the heat number stamped or cast upon it. Each forging shall have the mark number stamped upon it. Dimensions of castings shown on the approved shop drawings will be the finish dimensions.

b. Castings. - Repairs to castings shall not be made without the knowledge and prior approval of the Contracting Officer. Where repair welding is permitted, it shall be performed in accordance with the requirements of paragraph 31-03e (6). Warped or otherwise distorted castings or castings that are oversize to such an extent as will interfere with proper fit with other parts of the machinery will be rejected. The structure of the metal in the castings shall be homogeneous and free from excessive nonmetallic inclusions. Excessive segregation of impurities or alloys at critical points in a casting will be cause for its rejection.

31-11. PATTERNS. - In the construction of patterns, care shall be taken to avoid sharp corners or abrupt changes in cross section, and ample fillets shall be used. The contractor shall add such draft and increases in pattern thicknesses as will conform to his standard foundry practice and as may be necessary to insure that all metal thicknesses of the finished castings will be in accordance with the dimensions shown on the drawings within the tolerances specified in paragraph 31-10. All patterns will remain the property of the contractor.

31-12. LISTS OF MATERIALS. - The contractor shall furnish the Contracting Officer with six copies of all purchase orders, mill orders, shop orders for materials, and work orders, including all orders placed or extended by each supplier. Where mill tests are required, the purchase orders shall contain the test site address and the name of the testing agency. The contractor shall also furnish a shipping bill or memorandum of each shipment of finished pieces or members to the project site, giving the designation mark and weight of each piece, the number of pieces, the total weight, and if shipped by rail in carload lots, the car initial and number. Copies of certified shipping bills, in duplicate, shall be mailed promptly to the Contracting Officer.

31-13. SHOP ASSEMBLY. - Unless otherwise specified, each machinery and structural unit furnished shall be assembled in the shop to determine the correctness of the fabrication and matching of the component parts. The tolerances shall not exceed those shown on the drawings and each unit assembled shall be closely checked to insure that all necessary clearances have been provided and that binding does not occur in any moving part. Assembly and disassembly work shall be performed in the presence of a Government inspector, unless waived in writing by the Contracting Officer, and any errors or defects disclosed shall be immediately remedied by the contractor, without cost to the Government. Before disassembly for shipment, each piece of a machine or structure shall be match-marked to facilitate erection in the field. The location of match-marks shall be indicated by circling with a ring of white paint after the shop coat of paint has been applied, or as otherwise directed.

31-14. FIELD ASSEMBLY. - a. General. - All parts to be installed shall be cleaned thoroughly; all packing compounds, rust, dirt, grit, and other foreign matter removed; all holes and grooves for lubrication cleaned; and all enclosed chambers or passages examined to make sure that they are free from injurious materials. Where units or items are shipped as assemblies they will be inspected by a representative of the Contracting Officer prior to installation. Disassembly, cleaning and lubrication will not be required except where there is indication that such work is necessary to place the assembly in a clean and properly lubricated condition. The top of all steel floor plating shall be installed flush with abutting curb surfaces. Stillson wrenches, cold chisels, or other tools likely to cause injury to the surface of rods, nuts, or other parts shall not be used for the work of assembling and tightening parts. Bolts and screws shall be tightened firmly and uniformly, but care shall be taken not to overstress the threads by using excessive force or wrenches of excessive length. When a half nut is used for the purpose of locking a full nut, the former shall be placed first and followed by the latter. Threads of all bolts, nuts, and screws shall be lubricated by graphite and oil before assembly. Driving and drifting bolts or keys will not be permitted.

b. Alignment and Setting. - Each machinery or structural unit shall be accurately aligned by the use of steel shims, or other approved methods, so that no binding in any moving parts of distortion of any members occurs before it is finally fastened in place. The alignment of all parts with respect to each other shall be true within the respective tolerances required. The machines shall be set true to the elevations shown on the drawings.

c. Blocking and Wedges. - All blocking and wedges used for the support, during installation, of parts to be grouted in shall be removed before final grouting, unless otherwise directed by the Contracting Officer. Blocking and wedges left in the foundation with the approval of the Contracting Officer shall be of steel or iron.

d. Foundations and Grouting. - Concreting of sub-bases and frames and the final grouting under parts of machines shall be in accordance with the procedures as specified in Section, CONCRETE.

31-15. TESTS AND TRIALS. - a. General. - The contractor shall at his expense, perform analyses and tests to demonstrate that all materials are in conformity with the specifications, except where such tests are waived in writing by the Contracting Officer. Should the contractor desire to use stock materials, not manufactured specifically for the work covered by these specifications, he shall submit evidence satisfactory to the Contracting Officer that such material conforms to the requirements of the specifications and detail tests of these materials will not be required, if so approved by the Contracting Officer. Tests, except where modified, shall be made as indicated in the respective detailed specifications or on the drawings and, unless otherwise authorized, in the presence of the Contracting Officer. The contractor shall furnish the Contracting Officer certified reports in triplicate of all required analyses and tests. The contractor shall furnish to the Contracting Officer, upon request, specimens and samples for independent analysis and test, all properly labeled and prepared for shipment.

b. Analysis of Material. - The contractor shall furnish the Contracting Officer certificates listing the heat numbers and the chemical and physical properties of the metal from which each article or piece of material was made. There shall be furnished also, two lists; one from the shop showing what pieces or members are to be made from the material ordered, and the other from the mills showing what pieces or members are furnished from each heat or melt.

c. X-Ray and Gamma-Ray Tests. - When doubt exists as to the soundness of any part, such part may be subjected to an X-Ray or Gamma-Ray inspection at the discretion of the Contracting Officer, and the cost of such inspection will be borne by the Government.

31-16. MEASUREMENT AND PAYMENT. - a. Measurement. - All metalwork, for which payment is not otherwise specifically provided elsewhere in these specifications, will be measured for payment on a pound basis. Measurement will be based on computed weights, per fabricated piece or assembly or cast piece for the various metals as classified on the approved shop drawings, except as indicated below. When measurement of complicated shapes can be determined more readily by scale weights per fabricated or cast piece or assembly, the use of certified scale weights may be approved as the basis for measurement.

(1) Computed Weights. - Computed weights for payment shall be the net calculated weights based on the dimensions indicated on the shop drawings. The weight of rolled shapes and plates shall be computed on the basis of their nominal weights and dimensions. In calculating the net weights, all copes, cuts, and all open holes, except rivet and bolt holes shall be deducted. No additional weight shall be calculated for over-weight allowance, rivets, bolts, and washers, protective coatings, allowance for milling, grip length of rivets and bolts, and butt and groove welds. The weight of castings, including fillets will be computed on the basis of the dimensions shown on the shop drawings, deducting for all openings and cuts in the finished casting.

The following weights per cubic inch will be used in computing weights of metalwork and rubber.

Iron Castings	0.260 pounds
Steel (All Compositions)	0.283 pounds
Copper, Bronze, Brass; Nickel-Copper Alloy	0.311 pounds
Lead	0.409 pounds
Aluminum	0.100 pounds
All Other Metals	0.283 pounds
Steel, Pipe and Wrought Iron	Wt. per foot based on computing weight as specified in Fed. Spec. WW-P-406a and WW-P-441b, respectively

(2) Scale Weights. - Unless otherwise specifically authorized, shop scale weight measurements shall be made in the presence of the Contracting Officer. The weight of erection bolts, nuts, washers, as well as boxes, crates and other containers used for packing, and the materials used for supporting members during transportation, will not be included in the scale weights. It shall be the responsibility of the contractor to prepare the shipping lists, furnished in accordance with paragraph 31-13, in such a manner as to make possible the correct allocation of the scale weights of individual metal parts and members to the applicable payment classifications. Failure to comply with this

requirement, to the satisfaction of the Contracting Officer, will necessitate measurement by computed weights. The weight of shop applied protective coatings will not be deducted from scale weights.

b. Payments. - Payments for all metalwork, not included under other items, covered by this section will be made at the contract price per pound for each applicable item of the Unit Price Schedule. The contract prices will include all costs for material and work for fabricating, shop and field painting, placing the metals shown on the drawings or required by these specifications, and for galvanizing or other metallic coatings, unless otherwise specified. Where payment is based on scale weights, no payment will be made for material in excess of a variation of 4 percent for fabricated shapes, bars, and plates, and 5 percent for castings and forgings, from the net weight as calculated from the dimensions shown on the approved shop drawings, unless otherwise authorized by the Contracting Officer. Except where the payment item is specifically indicated on the drawings or specified herein, no separate payment will be made for bolts, nuts, pins, washers, studs and strap hangers, and the cost of such items shall be included in the unit prices of items on which they are used.

c. Partial Payment. - Unless otherwise specified, partial payments for metalwork which is covered by this section will be included in the regular payment estimate, following delivery, acceptance and satisfactory storage of the material, provided that such payments do not represent a disproportionate amount of the total funds available for the work to which the material pertains. Such payments will be determined on the basis of the contract unit price for the item, and the delivered cost of the material to the contractor. A sufficient amount will be retained to insure proper storage and installation of the material. If any material partially paid for is not protected in a satisfactory manner, the material will be protected by the Contracting Officer and any costs therefor will be borne by the contractor. (See paragraph GC-8, "Protection of Material and Work)".

Connecticut River Flood Control Project - Westfield River Littleville Dam - Volume 3 1962



1962 Reports

Specifications for Dam and appurtenant structures. Middle Branch of Westfield River.

City/Town	Westfield
Dam	Littleville Dam
Name	U S Army Engineers
Name	Massachusetts Comm
Water	Westfield River
Water	Connecticut River

Serial No. CIVENG-19-016-62-49

CONNECTICUT RIVER FLOOD CONTROL PROJECT

SPECIFICATIONS

FOR

CONSTRUCTION

OF

LITTLEVILLE DAM

AND

APPURTENANT STRUCTURES

MIDDLE BRANCH, WESTFIELD RIVER

MASSACHUSETTS

VOLUME III OF III

Technical Provisions
(Sections 32 - 43)

U. S. ARMY ENGINEER DIVISION, NEW ENGLAND

CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS

TABLE OF CONTENTS

VOLUME I OF III

INVITATION FOR BIDS

BID FORM

PART I - GENERAL CONDITIONS

PART II - SPECIAL CONDITIONS

PART III - TECHNICAL PROVISIONS

Section No.	Title
1	PREPARATION OF SITE
2	CONTROL OF DIVERSION OF WATER
3	EXCAVATION - OPEN CUT
4	EXCAVATION - TUNNEL AND SHAFT - ITEMS 7 & 8
5	ROCK BOLTING
6	TUNNEL RIB SUPPORTS
7	EMBANKMENTS
8	ROCK SLOPE PROTECTION, SELECTED RIPRAP AND GRAVEL BEDDING
9	MISCELLANEOUS FILLS, ROADS, DRIVES, AND PARKING AREAS
10	CULVERT
11	FOUNDATION DRILLING AND GROUTING
12	TUNNEL GROUTING
13	ANCHOR BARS
14	CONCRETE

VOLUME II OF III

15	48-INCH WATER SUPPLY PIPE
16	WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT - MISCELLANEOUS
17	FLOAT WELL AND AIR VENT
18	SLUICE GATES, VALVES AND ACCESSORIES
19	OMITTED
20	OMITTED
21	OMITTED
22	TRAVELING CRANES
23	DIESEL ENGINE-GENERATOR SET
24	VENTILATING SYSTEM, MECHANICAL
25	ELECTRICAL WORK; INTERIOR
26	HEATING SYSTEMS, FORCED-WARM-AIR: OIL-FIRED FURNACE
27	ELECTRICAL-EXTERIOR
28	STRUCTURAL STEEL BRIDGES
29	MISCELLANEOUS METAL ITEMS
30	METALS, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES
31	METALWORK FABRICATION, MACHINE WORK, AND MISCELLANEOUS PROVISIONS

VOLUME III OF III

Section No.	Title
32	TRENCH EXCAVATION AND BACKFILLING FOR UTILITIES, DRAINS AND CULVERTS
33	MISCELLANEOUS ITEMS OF WORK
34	UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
35	PLUMBING, GENERAL-PURPOSE
36	HEATING SYSTEM; FORCED-HOT-WATER, OIL-FIRED
37	WATER SUPPLY WELLS
38	WATER AND SEWER SYSTEMS
39	OMITTED
40	PAINTING
41	BITUMINOUS CONCRETE PAVEMENT
42	BITUMINOUS SURFACE TREATMENT
43	TOPSOILING, SEEDING AND MULCHING

SECTION 32

TRENCH EXCAVATION AND BACKFILLING
FOR UTILITIES, DRAINS AND CULVERTS

INDEX

Paragraph No.	Paragraph Title	Page No.
32-01	Scope	32-1
32-02	Excavation	32-1
	a. General	32-1
	b. Trench Excavation	32-1
	c. Excavation for Appurtenances	32-2
32-03	Backfilling	32-2
32-04	Measurement and Payment	32-2
	a. Trench Excavation - Earth and Backfill	32-3
	b. Trench Excavation-Rock	32-3
	c. Sheeting Left in Place	32-4

SECTION 32

TRENCH EXCAVATION AND BACKFILLING
FOR UTILITIES, DRAINS AND CULVERTS

32-01. SCOPE. - Work covered by this section consists of furnishing all plant, labor, equipment, appliances and materials and performing all operations in connection with excavation, trenching and backfilling for drains, culvert, underground utilities and appurtenant structures to the points of connection with the building utilities 5 feet outside of the buildings except as otherwise specified, or indicated, complete, as shown on the drawings and specified hereinafter.

32-02. EXCAVATION. - a. General. - The contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and wasted in specified spoil areas as indicated on the drawings or as directed by the Contracting Officer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavation, and any water accumulating therein shall be removed by pumping or by other approved method. Such sheeting and shoring shall be done as may be necessary, for the protection of the work and for the safety of personnel. Excavation shall be classified as stated in Section "Excavation - Open Cut" except that boulders measuring one cubic yard or more in volume shall be classified as rock excavation.

b. Trench Excavation. - Trenches shall be of necessary width for the proper laying of the pipe as specified in other sections for the particular utility, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for pipe bells and for the proper sealing of pipe joints. Bell holes and depressions for joints shall be excavated no larger than necessary for properly making the particular type of joint. Except where bedrock or boulders are encountered, care shall be taken not to excavate below the depths indicated. Where bedrock is encountered, the bedrock shall be excavated to a minimum overdepth of 6 inches below the trench depths indicated on the drawings or specified. Overdepths in the rock excavation, unauthorized overdepths and overdepths due to removal of boulders, shall be backfilled with compacted pervious backfill in

accordance with the applicable requirements of Section 7. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench shall be backfilled to the proper grade with compacted pervious backfill in accordance with the applicable requirements of Section 7. Special requirements are as follows:

(1) Sewers, Culverts and Drains. - For sewers, culverts and drains, the width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench will shall not exceed 8 inches on either side of the pipe. The width of the trench above that level may be as wide as necessary for sheeting and bracing and performance of the work. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for as nearly the full length of the barrel proper as jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by men skilled in this type of work.

(2) Water Supply System. - Trenches for water lines shall be of a depth that will provide the minimum cover of 5'-0" over the top of the pipe measured from the existing ground surface or the indicated finished grade, whichever is lower, and avoid interference of the water lines with other utilities.

c. Excavation for Appurtenances. - Excavation for manholes, tanks, valve boxes, and similar structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the excavated surface of timber which may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed by the Contracting Officer shall be considered as unauthorized and shall be backfilled to the desired grade in accordance with the applicable requirements of Section 7, or with concrete as directed and at the expense of the contractor.

32-03. BACKFILLING. - The trenches shall not be backfilled until all specified tests are performed and until the utilities systems, as installed, conform to the requirements specified in the several sections covering the installation of the various utilities. Where, in the opinion of the Contracting Officer, damage is likely to result from withdrawing the sheeting, the sheeting shall be left in place and the contract price will be adjusted accordingly. The trenches shall be carefully backfilled with material free from stumps, roots, sod, frozen soil, large stone, rubbish, or other unsuitable materials. The backfill material shall consist essentially of the same material as excavated from the required excavation with large stones removed for uncompacted backfill and stones with a maximum dimension greater than 3

inches removed for compacted backfill. It shall be deposited in 4-inch layers and thoroughly and carefully compacted until the pipe or other utilities has a cover of not less than 2 feet. Except as stated below, the remainder of the backfill materials shall then be placed into the trenches by use of a bulldozer or other approved equipment, unless otherwise directed, to insure no damage to pipes. The surface of the uncompacted backfill shall be mounded above the required grade and the backfill shall be compacted with 4 coverages of a thread of a crawler type tractor traveling lengthwise of the trench. The surface of the backfill shall be left in a mounded condition except in graded areas where the mounds will be smoothed off during grading. Portions of trenches across areas to be paved and foundation areas for curbs, sidewalks, concrete slabs and other structures and other areas where, in the opinion of the Contracting Officer, a compaction is required to prevent settlement detrimental to a structure shall be backfilled as specified above, except that the backfill for the entire depth of the trench shall be spread in 4-inch layers and each layer shall be compacted by 4 coverages of approved power tampers. Backfill for drainage and appurtenant structures shall be as specified for backfill around and over pipes. If no pipes adjoin the structure, backfill shall be as specified above for backfill over pipes after the two foot cover is placed. Uncompacted backfill under tanks and overhanging portions of structures shall be placed in a manner to insure complete filling of the excavated area.

32-04. MEASUREMENT AND PAYMENT. - a. Trench Excavation - Earth and Backfill. - No separate payment will be made for unclassified excavation or backfill or refill required for the construction of underground utilities, drains and culverts and all costs thereof shall be included in the applicable contract unit or lump sum prices for the specific utility or drainage system or culverts or appurtenant structure. Payment of these items will constitute full compensation for excavation (except classified rock) and backfilling, including the additional width of excavation at manholes and similar structures, placement of bedding materials, and including the furnishing, placing and removal of sheeting and bracing, and all incidentals necessary to complete the work required by this section of the specifications.

b. Trench Excavation - Rock. - The quantity of rock excavation to be paid for will be the number of cubic yards of actual total volume of boulders greater than 1 cubic yard in size removed during the excavation operations and the volume of acceptably excavated bedrock material as hereinbefore specified and defined as rock excavation, measured in its original position, and computed by allowing a 30-inch width of excavation of bedrock. The measurement will include authorized overdepth rock excavtion. In rock excavation for manholes and other appurtenances, one foot will be allowed outside of the wall lines of the structures. Payment for rock excavation will be made at the applicable contract unit

price for "Rock Excavation General" for the specific site of the work and will include all necessary drilling and blasting, and all incidentals necessary to satisfactorily excavate and dispose of authorized rock excavation. No extra payment will be made for the placement of bedding materials and these costs shall be included in the applicable contract unit price per cubic yard of Rock Excavation General.

c. Sheeting Left in Place. - In the event sheeting is directed to be left in place, a suitable adjustment will be in the contract.

SECTION 33

MISCELLANEOUS ITEMS OF WORK
(Item 72, and 88 thru 93, incl.)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
33-01	Scope	33-1
33-02	Tile Gages	33-1
	a. General	33-1
	b. Construction	33-1
	c. Payment	33-1
33-03	Chain Link Fencing - 4 Feet	33-1
	a. General	33-1
	b. Material and Description	33-1
	c. Payment	33-2
33-04	Chain Link Fencing 7 Feet	33-2
	a. General	33-2
	b. Materials	33-2
	c. Installation	33-3
	d. Payment	33-3
33-05	Flagpoles and Base	33-4
	a. General	33-4
	b. Material	33-4
	c. Construction Methods	33-4
	d. Flagpole Base	33-4
	e. Grounding	33-4
	f. Payment	33-4
33-06	Log Boom	33-5
	a. General	33-5
	b. Materials	33-5
	c. Construction	33-5
	d. Payment	33-5
33-07	Highway Guard Rail and Guard Posts	33-5

Paragraph No.	Paragraph Title	Page No.
	a. Highway Cable Guard Rail	33-6
	b. Guard Posts	33-6
	c. Measurement and Payment	33-6
33-08	Precast Concrete Curb	33-6
	a. Gravel	33-7
	b. Excavation	33-7
	c. Curb Foundation	33-7
	d. Setting Curb	33-7
	e. Protection	33-7
	f. Backfilling	33-8
	g. Payment	33-8

SECTION 33

MISCELLANEOUS ITEMS OF WORK

(Item 72, and 88 thru 93, incl.)

33-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances, and materials, and in performing all operations in connection with miscellaneous work items listed below, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

33-02. TILE GAGES. - a. General. - The contractor shall install the tile gages at the locations and in accordance with the design and dimensions shown on the drawings.

b. Construction. - The tile gages shall be erected in sections as shown on the drawings, and shall be constructed of black figures on glazed white field of ceramic tile of standard manufacture. The tile shall be assembled by pasting on sheets of paper in panels of 1 foot lengths; a sample shall be furnished to the Contracting Officer for approval before erection. Figure sheets as received from the manufacturers shall be placed in an accurate mold on a glass plate and backed with cement mortar about 1-1/2 inch thick; the mortar shall be a 1 to 1 mixture of cement and sand of suitable consistency when combined with water, and shall be reinforced with expanded metal or wire fabric. Reinforcing shall extend beyond both edges of the mortar to form anchorages as shown on the drawings. After final set, molds shall be removed and the panels shall be cured by immersion in water for a period of 10 days. The tile panels may be prepared in convenient lengths of even feet.

c. Payment. - Payment for the tile gages as specified above, complete and accepted, will be made at the applicable contract lump sum prices for Item No. 72, "Tile Gages", and shall include all costs in connection therewith, including cost of cement, concrete, grout holding panels and reinforcement.

33-03. CHAIN LINK FENCING - 4 FEET. - a. General. - Chain link fencing four feet in height shall be installed where and as shown on the drawings. Fencing shall be braced at changes in direction at ends, and where 4-foot fencing meets 7-foot transformer pen fencing in accordance with manufacturer's recommendations.

b. Material and Description. - (1) Posts shall be galvanized and shall be in accordance with Federal Specification RR-F-183. Line

47

posts shall be 2" O.D. tubular steel pipe weighing at least 2.7 lbs. per lin. ft. Top railings shall be 1-5/8" O.D. tubular steel pipe weighing at least 2.28 pounds per linear foot. End, corner and angle posts shall be 3 inch O.D. tubular steel pipe weighing at least 5.79 pounds per linear foot. The line posts shall be spaced not more than 10 feet on centers and embedded in the manner and depth shown on the drawings. All posts shall have an ornamental ball top.

(2) The fencing fabric shall conform to the requirements of Federal Specification RR-F-191a, Type A. The fabric shall be made of 2 inch diamond mesh (4 foot high) chain link, galvanized steel wire fencing, No. 9 gage. The fencing shall be set to line and grade as shown on the drawings or as directed. Both edges of the fabric shall have a knuckled finish. The fence shall have top rail not less than 1-5/8 inches (2.28 pounds per linear foot) nominal outside diameter, galvanized, tubular steel pipe. Tension wire along bottom of fabric shall be zinc coated No. 6 or 7 coil spring wire.

(3) Aluminum fabric ties of suitable gage shall be provided for attaching the wire mesh to the posts.

(4) The fencing shall be constructed and installed as herein specified and in accordance with the best methods for workmanship adopted for this type of work in accordance with manufacturers' instructions and shall be pursued to a satisfactory completion as approved by the Contracting Officer.

c. Payment. - Payment for funishing and installing 4 foot high chain link fencing will be made at the applicable contract unit prices per lineal foot for Item No. 90, "Chain Link Fencing - 4 Feet High", measured along the fence line between the end posts. The contract price shall include all costs in connection with earth and rock excavation, concrete foundations, and grouting sockets.

33-04. CHAIN LINK FENCING 7 FEET. - a. General. - Chain link fencing, 6 feet in height with one foot extension arm, including gage, shall be installed where and as shown on the drawings for the transformer pen. Fencing shall conform to Drawing No. 40-16-03, attached at end of Section. Fencing shall be braced at gate and corners in accordance with the manufacturer's recommendations.

b. Materials. - (1) All materials including posts shall be galvanized and shall be in accordance with the applicable requirements of Federal Specification RR-F-183. Line posts shall be 2-1/2 inch O.D. tubular steel pipe weighing at least 3.65 pounds per linear foot or 2-1/4 inch H section not less than 4.1 lbs per linear foot. Railings shall be 1-5/8 inch O.D. tubular steel pipe weighing at least 2.28

pounds per linear foot. End and corner posts and gate posts shall be 3 inch O.D. tubular steel pipe weighing at least 5.79 lbs., per linear foot. The line posts shall be spaced not more than 10 feet on centers and embedded in the manner and depth shown on the drawings.

(2) The fencing fabric shall conform to the requirements of Federal Specification RR-F-191a, Type A. The fabric shall be made of 2 inch diamond mesh, 6 feet in height, chain link galvanized steel wire fencing, No. 9 gage. The fencing shall be set to line and grade as shown on the drawings or as directed. Both ends of the fabric shall have a twisted and barbed top and bottom edges. Barbed wire shall be 4 point barbed wire.

c. Installation. - (1) General. - The fence shall follow the profiles of the ground. Depressions shall be filled with fabric or compacted earth fill. In the event fill is provided, it shall not interfere with natural ground drainage. Bottom edge of fabric shall be two inches above ground, concrete, or fill as the case may be.

(2) Fence. - Posts shall be set in concrete or leaded into sockets, as applicable, at approximately 10 foot intervals as shown on the drawings. Bases shall extend at least 4'-0" below grade. The fabric shall be stretched to give proper tension and shall be attached to rails with No. 6 gage aluminum bands, and attached with not less than six No. 6 gage aluminum bands to every intermediate post. Extension arms shall be provided for all fencing.

(3) Gate. - Gate shall be of width noted on the drawings and constructed with malleable iron fittings, securely braced and trussed up with welded connections. Gate shall be provided with a positive stop. Gate shall be filled with fabric to match fencing and shall have 3 strands of barbed wire. Gate shall be equipped with pivot type malleable iron hinges and brass padlock. Gate shall be provided with fork latch with provisions for padlocking. Padlock (Type EPC, size 2-inch with chain) shall be provided for gate.

(4) Terminal Posts. - Terminal posts shall be fastened with steel stretcher bar bands and 3/8 inch diameter rods with turnbuckles. Tension bars shall be 3/16 inch by 3/16 inch by 3/4 inch high carbon steel attached to terminal posts by means of beveled edged bands.

(5) Concrete. - The concrete shall be well rodded, spaded, and tamped as necessary.

d. Payment. - No separate payment will be made for the work specified in this paragraph and payment for furnishing and installing

chain link fencing 7 feet high, including gate, will be included in the lump sum contract price for Item No. 87, "Electrical Work, Exterior".

33-05. FLAGPOLE AND BASE. - a. General. - The contractor shall install the flagpole and base, as shown on the drawings and as specified and shall construct concrete walk as shown.

b. Material. - The base shall be constructed of reinforced concrete conforming to the requirements of Section 10, CONCRETE. The flagpole shall be machine made of 6063-T6 seamless cold drawn aluminum of 3/16 inch wall thickness and have a uniform conical taper throughout the tapered portion. The pole shall have a smooth uninterrupted exterior surface without visible joints or offsets, shall have a machined satin brush finish and shall be shipped in one piece. Accessories to be furnished by the contractor include: A 14-gage aluminum 8-inch diameter satin finished ball; an aluminum body non-fouling truck revolving on an aluminum spindle with ball race and stainless steel balls, fitted with two 2-3/8 inch diameter aluminum sheaves rotating on 3/8 inch dural pins; two sets of 5/16 inch diameter #10 cotton braided rope halyards each with two aluminum snaps for securing to flag; two 9-inch cast aluminum cleats each attached to the pole with flat head dural machine screws. All aluminum surfaces shall have a heavily waxed finish.

c. Construction Methods. - The flagpole shall be set in the concrete foundation as indicated on the drawings. The erection of the flagpole shall be in strict accordance with the manufacturer's specifications.

d. Flagpole Base. - The forms shall be removed as soon as practicable. The exposed surfaces shall be thoroughly wetted and rubbed with No. 20 corundum stones. The lather that works upon the surface shall be removed by brushing and washing. Small voids in the surface shall be filled with a mortar composed of one part cement and two parts of the same sand used in the concrete. The mortar shall be worked into the surface with the corundum stones so that no appreciable thickness of coating remains. After a period of approximately 4 weeks, the surfaces shall again be thoroughly wetted and rubbed down with No. 24 corundum stones. The lather that works up shall be removed with a clean wet brush.

e. Grounding. - The flagpoles shall be grounded as indicated on the drawings. The two-hole bi-metallic tongue terminal lug shall be attached to the flagpole using dural machine bolts.

f. Payment. - Payment will be made at the contract lump sum price for Item No. 92, "Flagpole" and which price shall include all

costs of excavation and backfilling, furnishing, assembling, erecting, cleaning the flagpole and construction of concrete base and concrete walk including cement, concrete, reinforcing steel and grounding.

33-06. LOG BOOM. - a. General. - The contractor shall furnish, construct and erect log boom at the location upstream of the dam as indicated on the drawings. Concrete shall conform to the requirements of Section "CONCRETE".

b. Materials. - (1) Boom logs shall be white pine or spruce having a minimum diameter of 10 inches at the tip and shall be furnished in 18 foot to 20 foot lengths, except the maximum length shall be reduced to follow final finish grade and permanent pool elevations and to avoid abrupt changes, and shall be bored with a 2-1/4 inch hole at each end. Logs shall be sound, straight, free from rot, and shall be approved prior to use. To the extent such logs are available, the contractor shall use logs obtained in the course of clearing operations. The steel piles and anchors shall be the size indicated on the drawings. The steel shall conform to Federal Specification QQ-S-751a for "Steel; Structural (including Steel for Cold Flanging) and Steel Rivet; (for) ships other than Naval Vessels".

(2) Boom cable shall be new 3/4 inch galvanized wire rope 3 strand, 7 wires to the strand, conforming to the requirements of Federal Specification RR-R-571a for "Rope, Wire", Type III, preformed.

(3) Boom chains shall be fabricated from 1/2 inch galvanized stock, approximately 5-1/2 feet long, overall, similar and approved equal to American Chain Co., Type "B". The rings and toggles shall meet the same specifications for the boom chains.

c. Construction. - A hole approximately 2-1/4 inch in diameter shall be bored through each end of the log. The log shall be connected end to end by passing the boom chains through the bored holes and the whole assembly reinforced by threading the 3/4 inch wire rope through the rings of the boom chains. The ends of the cable shall be anchored to the steel piles embedded in concrete or earth, as shown on the drawings.

d. Payment. - Payment for the log booms complete as specified, will be made at the contract lump sum price for Item No. 93, "Log Boom", and shall include all costs in connection therewith, including all metallic items, painting and end anchorages.

33-07. HIGHWAY GUARD RAIL AND GUARD POSTS. - Highway cable guard rail and guard posts shall be installed where and as indicated on the drawings.

47

a. Highway Cable Guard Rail. - Highway cable guard rail shall be 2 cable type guard rail (type C2C) with concrete posts conforming to the requirements of Standard Specifications for Highways and Bridges as issued by the Commonwealth of Massachusetts under Section E-2, except as otherwise indicated on the drawings or specified.

b. Guard Posts. - Guard posts shall conform to the applicable requirements as specified above for highway guard rail, except as otherwise indicated on the drawings.

c. Measurement and Payment. - (1) Guard Rail measurement will be made by linear foot of cable guard rail satisfactorily installed measured between centerlines of end posts. Payment will be at the contract unit price for Item 88, "Cable Guard Rail", which price shall include all costs in connection with providing the guard rail complete with concrete posts, including cement, accessories, bracing, I beam end posts and concrete bases at Service and access bridges, excavation, backfill, painting and disposal of surplus materials.

(2) Payment for guard posts, exclusive of those for highway guard rail, will be made at the contract unit price each for Item 89, "Guard Posts" for the number of posts installed and shall include all costs of excavation, backfill, painting and disposal of surplus materials except for chains, attachments and padlocks. Chains, attachments and padlocks will be measured and paid for under Item, "Miscellaneous Metals".

33-08. PRECAST CONCRETE CURB. - All precast cement concrete curb (straight and curved) shall be certified to conform to the requirements of this paragraph.

Precast concrete curb shall consist of air entrained concrete castings conforming to the size and dimensions shown on the plans. Straight and curved curb shall be cast in standard lengths of 6 feet. Straight and curved curb may be cast in lengths not less than 4 feet where necessary and as directed. Curb on a radius of 150 feet or less shall be cast to the correct radius. Portland Cement shall conform to Federal Specification SS-C-192d, Type I or Type II. Cement will be accepted on the basis of mill certificates of compliance with the Federal Specification. Forms shall be metal or wood and shall be tight, rigid construction, true to shape and with a smooth finish. Concrete forms may be used if approved by the Contracting Officer. Concrete shall be air entrained with a minimum allowable compressive strength at 28 days of 3000 pounds per square inch. Air-entrained concrete shall be designed for 5.5 percent air. Upon removal from the forms, the top and eight inches of the face shall be rubbed with a carborundum brick in an approved manner to fully remove any cement enamel finish. No cement shall be used in the process. Next, a mixture of fine sand, cement

and water shall be thoroughly ground into the surface of the curb with a carborundum stone until the resulting paste fills any minor imperfections left by the form. A cork float shall then be used to pick up all excess paste and to put a final finish on the curb resembling sandstone in appearance. The color and finish of the castings shall be uniform, and shall conform to those of adjacent work in final position. Immediately after finishing, the castings shall be entirely covered and fully cured under the double thickness of saturated burlap or by an equivalent approved method for a period of 7 days at a temperature of not less than 60 degrees F. The burlap shall be kept thoroughly saturated for the entire curing period. Upon delivery, the castings shall be wetted and inspected for crazing, any evidence of which will cause rejection.

a. Gravel. - Gravel shall consist of hard, durable stone coarse sand, uniformly graded from coarse to fine and containing no stone having any dimension greater than two (2) inches. The grading shall conform to the following requirements:

Passing 3/8 inch Sieve	40% min. 70% max.
No. 4	25% min. 50% max.
No. 200	5% max.

Not more than 3% shall pass the 0.02 mm.

b. Excavation. - The trench for the curb shall be excavated to a width of 18 inches. The subgrade of the trench shall be a depth below the proposed finish grade of the curb equal to 6 inches plus the depth of the curbstone. Whenever wet or otherwise unsuitable soil that is incapable of properly supporting the curbing, as determined by the Contracting Officer, is encountered in the bottom of the excavation, such soil shall be removed to the depth required and backfilled to the proper grade with coarse sand, fine gravel, or other suitable materials and thoroughly tamped.

c. Curb Foundation. - The foundation for the curb shall consist of gravel spread upon the subgrade and, after being thoroughly compacted by tamping, shall be 6 inches in depth.

d. Setting Curb. - Upon the foundation additional gravel shall be spread as required and the precast concrete curb shall be set thereon. All spaces under the curbstones shall be filled with gravel, thoroughly rammed so that the curbstones will be completely supported throughout their length. The curb shall be set at the line and grade required as shown on the plans or as directed by the Contracting Officer. The curb castings shall be laid so as to not fit closer to each other at any point than 1/4 inch, and they shall not be farther apart than 1/2 inch.

e. Protection. - The contractor shall protect the curb and keep them in first class condition until the completion of the entire

contract. Any curb which is damaged at any time previous to final acceptance of the work shall be removed and replaced with a satisfactory casting at the contractor's expense.

f. Backfilling. - After the curbing is set, the space between it and the wall of the trench shall be filled with gravel thoroughly tamped, to the depth shown on the plans, care being taken not to affect the line or the grade of the curb.

g. Payment. - Curb will be measured by the linear feet of curb installed and accepted measured along the top of curb to the nearest 0.1 of a foot. Payment will be made at the contract unit price for Item 91, "Precast Concrete Curb", which price shall include furnishing and placing curb, and excavation, gravel and backfilling.

SECTION 34

UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
(Items 96, 97, & 98)

(Index)

Paragraph No.	Paragraph Title	Page No.
34-01	Scope	34-1
34-02	Description of the Work	34-1
34-03	Drawings and Samples for Approval	34-1
	a. General	34-1
	b. Samples	34-1
34-04	Excavation, Backfilling and Grading	34-2
	a. General	34-2
	b. Grading	34-2
	c. Excavation	34-2
	d. Excess Material	34-2
	e. Sand and Gravel Fill	34-2
	f. Topsoil, Fertilizing and Seeding	34-3
	g. Trench Excavation	34-3
	h. Filling Near Foundation Walls	34-3
	i. Backfilling	34-3
34-05	Concrete	34-3
	a. General	34-3
	b. Splash Blocks	34-4
	c. Concrete Stairs and Platforms	34-4
	d. Slab on Grade	34-4
	e. Polyethylene Protective Sheeting	34-5
34-06	Dampproofing	34-5
34-07	Masonry Work	34-6
	a. Materials	34-6
	b. Handling and Storage of Materials	34-7
	c. Erection	34-7
	d. Pointing	34-8
	e. Cutting and Patching	34-8
	f. Unfinished Work	34-8
	g. Protection of Finished Work	34-8
	h. Calking	34-8
	i. Pointing and Cleaning	34-9

Paragraph No.	Paragraph Title	Page No.
34-08	Sheet Metal Work and Miscellaneous Metals	34-9
	a. Materials	34-9
	b. Soldering and Seaming	34-9
	c. Downspouts and Flashings	34-10
	d. Metal Clad Door and Frame	34-11
	e. Metal Ventilator	34-11
	f. Wire Grill	34-11
	g. Miscellaneous Sheet Metalwork	34-12
	h. Weatherstripping	34-12
	i. Aluminum Ladder	34-12
	j. Metal Combination Storm and Screen Doors	34-12
	k. Mirrors	34-12
	l. Cabinet for Paper Towels	34-13
	m. Metal Toilet Enclosures and Partitions	34-13
	n. Metal Louvers	34-13
	o. Metal Lavatory Shelves	34-13
	p. Bulkhead	34-13
	q. Medicine Cabinet	34-13
	r. Chimney Cleanout Doors	34-14
	s. Concrete-Filled Pipe Columns	34-14
	t. Metal Thresholds	34-14
	u. Clothes Poles	34-14
	v. Wrought Iron Hand Rails	34-14
	w. Extension Traverse Rods	34-15
	x. Master Room Door (Interior door)	34-15
	y. Robe Hook	34-15
	z. Basement Windows	34-15
34-09	Carpentry	34-15
	a. Lumber and Woodwork	34-15
	b. Other Materials	34-17
	c. Framing and Boarding	34-19
	d. Insulation	34-20
	e. Exterior Finish	34-21
	f. Wood Louver Ventilators	34-21
	g. Window Frames	34-21
	h. Sash	34-22
	i. Storm Sash	34-22
	j. Insect Screens	34-22
	k. Door Frames	34-23
	l. Doors	34-23
	m. Blocking, Strapping and Furring	34-25
	n. Interior Finish	34-25
	o. Kitchen Cabinets and Counters	34-26
	p. Planter	34-27
	q. Access Panel	34-27

Paragraph No.	Paragraph Title	Page No.
34-10	Asphalt Tile	34-27
	a. General	34-27
	b. Materials	34-27
	c. Design	34-28
	d. Preparation of Subfloor	34-28
	e. Installation	34-28
	f. Cleaning	34-28
	g. Protection	34-29
34-11	Lathing and Plastering	34-29
	a. General	34-29
	b. Materials	34-29
	c. Delivery and Storage	34-31
	d. Installation	34-31
	e. Grounds	34-32
	f. Mixing of Plaster	34-32
	g. Proportioning	34-32
	h. Application of Plaster	34-33
	i. Sampling	34-34
	j. Patching	34-34
	k. Marble Threshold	34-35
34-12	Ceramic Tile	34-35
	a. General	34-35
	b. Materials	34-35
	c. Accessories	34-36
	d. Installation of Floor Tile	34-36
	e. Installation of Wall Tile	34-37
	f. Cleaning	34-38
	g. Curing and Protection	34-38
34-13	Linoleum	34-38
	a. Materials	34-38
	b. Preparation of Subfloor	34-39
	c. Application of Felt Lining	34-39
	d. Application of Linoleum	34-39
	e. Edge Strips	34-40
	f. Cleaning	34-40
	g. Protection	34-40
34-14	Builders' Hardware	34-40
	a. General	34-40
	b. Lock Sets	34-40
	c. Materials	34-40
	d. Keys	34-43
	e. Finish	34-43

Paragraph No.	Paragraph Title	Page No.
34-15	Roofing	34-43
34-16	Shades	34-43
	a. General	34-43
	b. Materials	34-43
	c. Installation	34-44
34-17	Payment	34-44

SECTION 34

UTILITY BUILDING, OPERATORS' QUARTERS AND GARAGE
(Items 96, 97, & 98)

34-01. SCOPE. - The work covered by this section of the specifications consists in furnishing all labor, plant, equipment, materials and appliances, and performing all operations in connection with construction of the Operators' Quarters, Garage and Utility Building, complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

34-02. DESCRIPTION OF THE WORK. - a. General. - The buildings shall be of wood frame construction on concrete foundations, asphalt shingle roofs, concrete and wood floors, and shall be complete with plumbing, heating, and electrical systems. Construction of utility lines to line 5 outside the buildings are included with the buildings.

b. All concrete walks from the road to the house and from the house to the garage shall be included for payment with the Operators' Quarters.

34-03. DRAWINGS AND SAMPLES FOR APPROVAL. - a. General. - Before fabricating metal toilet partitions, shop fabricated sheet metal items, wrought iron rails, metal storm doors, metal louvers, metal ventilator and thresholds and weatherstripping for doors, detailed shop drawings supplemented by descriptive data shall be submitted for approval. Hardware schedules shall be submitted for approval prior to furnishing.

b. Samples. - Before delivery of any material to the site, the following samples shall be submitted for approval:

(1) All brick proposed for use in the above work.

(2) Insulation and tempered fiberboard.

(3) Asphalt tile and linoleum. - Samples, color chips and patterns shall be submitted for approval before the delivery of any tile, linoleum, felt, primer, cement and edging strips to the project site. Certificates of compliance shall be furnished for the above materials. Three sample tiles and two 12" x 12" pieces of linoleum shall be furnished.

(4) Ceramic Tile. - Two panels of wall and floor tiles for each color used. Two pieces of each tile shape used. One quart of adhesive and primer. Descriptive literature for accessories.

(5) Laminated Plastic. - Samples to show variation of standard colors compatible with linoleum furnished.

(6) Flagstone. - Sample 6" x 6" to show color range.

34-04. EXCAVATION, BACKFILLING AND GRADING. - a. General. - All work shall be executed to the lines and grades shown on the drawings. Shoring and unwatering the construction area shall conform to the applicable requirements of Section 3, EXCAVATION, and as stated below. Excavation shall be classified in Section 3 of these specifications except, that rock excavation shall include the removal of any boulder greater than 1 cubic yard in size.

b. Grading. - The entire Utility Building Area, and the Operators' Quarters Area shall be rough graded under the applicable requirements of Sections 3 and 9 prior to excavation or fill for the building foundations. Fill under Section 9 shall be brought up to the underside of subgrade for sand and gravel drainage fill under slabs and for topsoil.

c. Excavation. - Excavations shall conform to the dimensions and elevations shown on the drawings or as required for the construction of features covered in this section and shall include trenching for utility systems for the buildings to a line 5 feet outside the buildings and all work incidental thereto. Where suitable bearings are encountered at different elevations from those indicated on the drawings, the Contracting Officer may direct in writing that the excavation be carried to elevations above or below those indicated on the drawings, and an equitable adjustment will be made to the contract. Where the excavation is made below the elevations indicated on the drawings or directed, the excavation, if under slabs, shall be restored to the proper elevation in accordance with the prcedure hereinafter specified for fill, or if under footings, the depths of the walls or footing shall be increased, as may be directed. Excavation shall generally extend 12 inches outside the walls and footings to allow for placing and removal of forms, installation of services, and for inspection. Undercutting will not be permitted. Suitable excavated material which is required for fill under slabs shall be separately stockpiled as directed.

d. Excess Material. - Material from excavation, not required for fill or backfill, shall be used or disposed of as specified for material removed by unclassified excavation, general, in Section 3 of these specifications.

e. Sand and Gravel Fill. - Sand and gravel fill under concrete slabs and elsewhere as indicated on the drawings shall meet all the requirements for Gravel Fill Material as specified in Section 7, except that the material shall contain no stones greater than 3 inches in size. Irregularities in the rock surface within the Utility Building shall be filled with sand and gravel fill in layers not exceeding 4-inches in thickness, each layer being compacted by saturation and pneumatic tampers. The 6-inch layer of sand and gravel fill beneath floor slabs shall be compacted by four coverages of vibratory compactors or pneumatic tampers.

f. Topsoil, Fertilizing and Seeding. - Topsoil, fertilizing and seeding as required around the buildings shall be in accordance with Section 43, TOPSOILING, SEEDING AND MULCHING.

g. Trench Excavation. - All materials in the trenches for water and sewer pipes to a line 5 feet from the buildings shall be excavated to the lines and grades shown on the drawings or otherwise directed. Excavations shall be made wide enough to permit proper sheeting, bracing, and form work where necessary. All suitable excavated material shall be used for backfill as far as practicable. Trenches for water and sewer pipes shall be excavated generally to vertical lines 24 inches wider apart than the outside diameter of the pipe. The bottom of trenches shall be tamped hard and graded to secure the required fill. Bell holes shall be excavated so that the pipe will rest on solid ground for its entire length. Rock, where encountered, shall be excavated six inches below the bottom of the pipe, and before pipe is laid, the space between the bottom of pipe and the area shall be backfilled to the required grade with compacted pervious backfill as specified for compacted pervious backfill in Section 7 of these specifications. Sewer and water pipes shall be laid in separate trenches.

h. Filling Near Foundation Walls. - Where filling is done beside foundation walls, the fill shall be brought up essentially at the same heights on both sides at all times until the maximum level at the lower side is reached. Where a higher level of fill is required on one side of the foundation wall, the higher level must be properly compacted. Where a roller or tractor is used for compaction, the roller or tractor edge must not approach nearer than four feet from the face of the wall. The space so left shall be filled with compacted pervious backfill in accordance with requirements as stated in Section 7.

i. Backfilling. - After completion of foundation footings and walls and other construction below the elevation of the final grade, and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Prior to backfilling, the basement walls shall be dampproofed and inspected for approval of dampproofing. Material for backfilling shall consist of materials from required excavations or other materials approved by the Contracting Officer. Backfill shall be placed in accordance with the requirements stated in Section 32 for backfill for other work in the area. Each layer shall be compacted by machine tampers or by other suitable mechanical equipment to a density that will prevent excessive settlement or shrinkage. Precautions outlined above relative to filling near foundation walls, shall be observed while backfilling.

34-05. CONCRETE. - a. General. - All concrete work required for the building shall conform with the applicable requirements of Section 14, CONCRETE, with the following additional provisions:

(1) The maximum size aggregate shall not exceed 3/4-inch.

(2) Finish. - Where no special finish is required, the exposed concrete surfaces shall have all fine and rough edges removed, holes remaining from the bolts or rods and slight honeycomb and minor defects patched with mortar composed of 1 part cement to 2 parts sand. Steps and platforms shall be cast with the slab with risers and treads of uniform height and width. Exterior concrete treads shall slope 1/8-inch to the front and shall be left with a wood float finish. Concrete walks, aprons, and platforms shall be left with a wood float finish and scored as directed.

(3) Expansion Joints. - Expansion joints shall be constructed as indicated on the drawings and as approved. In no case shall the reinforcement, corner protection angles, or other fixed metal items, embedded in or bonded into concrete, be run continuous through an expansion joint.

(a) Joints between slabs on earth and vertical surfaces where indicated shall be of premolded expansion-joint filler strips conforming to Federal Specification HH-F-341a. Unless otherwise noted or specified, such joints shall be 1/2-inch thick and the full depth of slab.

(b) Joints with Compound. - Where joints are indicated to receive joint compound, the premolded expansion-joint filler strips, or other approved premolded strip material, shall be installed at the proper level below the finished floor with a slightly tapered, dressed-and-oiled, wood strip temporarily secured to the top thereof. The wood strip shall be of sufficient depth to form a groove not less than 1 inch deep. After the concrete has set, the wood strip shall be removed and the groove shall be filled with a light-colored calking compound or with compound for poured application. Joint grooves shall be filled approximately flush, so as to be slightly concave after drying.

(c) Finish at Joints. - Edges of cement floors or concrete slabs along expansion joints shall be neatly finished with a slightly rounded edging tool.

b. Splash Blocks. - Precast concrete splash blocks shall be provided at the outlet of downspouts, as shown, and shall be evenly bedded and set to slope from the building walls with discharge point approximately one inch above finish grade.

c. Concrete Stairs and Platforms. - Concrete stairs and platforms shall be given a wood float finish.

d. Slab on Grade. - The subgrade shall be brought to an even plane and compacted solid. Sand and gravel fill shall be deposited to the indicated thickness, and compacted and graded reasonably level. The fill shall be covered with vapor barrier. Concrete shall be deposited to the required thickness, and finished as specified.

(1) Vapor barrier shall be carefully installed to avoid puncture or tear. Punctures and tears occurring during subsequent operations shall be patched. Edges shall be lapped not less than 4 inches and end joints shall be lapped not less than 6 inches. Patches and lapped joints shall be sealed with a pressure-sensitive adhesive or pressure-sensitive tape not less than 2 inches wide. Adhesive or tape shall be compatible with the membrane, and as recommended by the manufacturer of the membrane. Vapor barrier shall be fungi-resistant when tested by the method set forth in Federal Specification L-S-137 and shall have a vapor permeance rating not exceeding 0.5 perm. as determined by method set forth in ASTM E-96, procedure E. Vapor barrier shall be asphalt-saturated waterproof reinforced kraft paper, clear polyethylene sheeting 0.006 inch thick, polyethylene-coated asphalt-saturated reinforced kraft paper, two layers of 30-pound asphalt-saturated felt solid-mopped with hot bitumen, or other similar material meeting above requirements for fungi-resistance and vapor permeance.

e. Polyethylene Protective Sheeting. - The polyethylene sheeting at exterior entrance stairs at the Operators' Quarters shall be cemented to the wood sheathing and conctete foundation wall in accordance with the manufacturer's instructions. Sheeting shall conform to vapor barrier material specified above. Cement shall be standard commercial product as recommended by the manufacturer of the polyethylene sheeting.

34-06. DAMPPROOFING. - a. Damproofing shall not be applied when the temperature is below 40 degrees F. and falling. The work shall be done by workmen experienced in the application of dampproofing, and the contractor shall coordinate dampproofing operations with other phases of the work to prevent staining or damaging finished work. The contractor shall repair or replace damaged finished work to the satisfaction of the Contracting Officer and without additional cost to the Government. Dampproofing may be either hot or cold application types, at option of the contractor.

b. Dampproofing shall be applied to the exterior surfaces of walls enclosing excavated basement spaces including basement stair walls for the Operators' Quarters, and shall extend from the bottom of foundation wall to within 4 inches of the finished grade.

c. Materials shall be delivered in sealed containers bearing the manufacturer's original labels. The following materials shall conform to the respective specifications designated below:

(1) Asphalt. - Federal Specification SS-A-666, type III.

(2) Asphalt Primer. - Federal Specification SS-A-701.

(3) Coal-tar Pitch. - Federal Specification R-P-381, type II.

(4) Creosote Oil. - Federal Specification TT-C-655.

(5) Fibrous Asphalt. - Shall conform to the requirements of Federal Specification SS-R-451, except that it shall contain not less than 12 percent of asbestos fiber.

d. Samples. - Before delivery of any material to the site, the following samples shall be submitted to the Contracting Officer for testing and approval:

Asphalt	- 5 pounds
Asphalt Primer	- 1 quart
Coal-tar Pitch	- 5 pounds
Creosote Oil	- 1 quart
Fibrous Asphalt	- 1 quart

e. Surfaces to receive dampproofing shall be smooth, clean, and dry. Holes, joints and cracks shall be pointed flush with mortar and high spots ground level with the surrounding surface. Before dampproofing, surfaces shall be swept clean of all foreign matter and shall be inspected and approved.

f. Hot-Application Type. - Exterior surfaces to be dampproofed shall be given either a priming coat of creosote oil and two mop coats of hot coal-tar pitch or a priming coat of asphalt primer and two mop coats of hot asphalt. The mop coats shall be applied uniformly, using not less than 25 pounds per 100 square feet per coat. Pitch or asphalt shall be heated to flow freely but not to more than 375 degrees F. for coal-tar pitch and 400 degrees F. for asphalt. The finished surface shall be smooth, lustrous, and impervious to moisture. Dull or porous spots shall be recoated.

g. Cold-Application Type. - Exterior surfaces to be dampproofed shall be given a priming coat of asphalt primer and a coat of fibrous asphalt applied uniformly, using not less than 30 pounds per 100 square feet, in such manner as to cover all pores completely and to thoroughly bond with the wall surface.

h. Backfilling. - Backfilling shall not be started before dampproofing has been completed and approved.

34-07. MASONRY WORK. - a. Materials. - (1) Brick. - Brick shall be whole, sound, straight, hard, uniform in structure, with true even faces and sharp corners and of uniform size. Brick shall be common clay or shale brick conforming to ASTM Standard C 62, except that brick for exterior facing, including planter and stairs, shall conform to ASTM Standard C 216, Type FBS, selected for color range of approved sample. Color of brick for Operators' Quarters stairs shall match that of planter. All brick shall be Grade SW. Brick for interior faces of walls that are to be left exposed shall be reasonably smooth. Brick to be

used in exterior work or in fireproof room, shall not be overburned, warped, or misshapen; and broken or chipped brick shall be set aside and used only in the backup and other unexposed parts of the work.

(2) Masonry Block. - Masonry block for Operators' Quarters planter wall below grade shall conform to ASTM Standard C 90, grade A.

(3) Flagstone. - Flagstone for Operators' Quarters stairs shall be 1" thick and of the color approved by the Contracting Officer and shall be set in mortar specified below.

(4) Flue Linings and Thimbles. - Flue linings and thimbles shall be terra cotta, free from blisters and warping, standard sizes, and of sound manufacture.

(5) Mortar. - Mortar for all work except joints in flue linings shall be composed of a 1:3 mix of masonry cement and sand, or of a 1:1:6 mix of portland cement, hydrated lime, and sand. Mortar for joints of flue linings shall be made with refractory cement - low temperature grade. Mortar materials and the method of mixing shall be subject to approval by the Contracting Officer.

b. Handling and Storage of Materials. - Brick shall be stored in an approved manner that will protect them from contact with soil and exposure to weather. Representative samples shall be taken from on-the-site stockpiles periodically for sampling. Care shall be taken in handling brick to avoid chipping and breakage. Storage piles, stacks, or bins shall be so located as to avoid being disturbed or shall be barricaded to protect these materials from damage by construction activities.

c. Erection. - (1) General. - Masonry shall not be erected when the ambient temperature is below 35° F. on a falling temperature except by written permission of the Contracting Officer. Masonry shall not be erected when, in the opinion of the Contracting Officer, the sun, heat, wind, or limitations of facilities furnished by the contractor prevent proper setting and curing of mortar joints or obtaining proper bond in the mortar. No frozen work shall be built upon. No brick or other units having a film of water or frost on their surface shall be laid on the walls. Clay brick having an initial rate of absorption in excess of 0.7 ounce per minute, determined in accordance with ASTM Standard C 67, shall be suitably wetted before laying. Corners and reveals shall be plumb and true. Structural bond shall extend not less than 4 inches into the backup unit masonry. Courses shall be so spaced that backing masonry will level off flush with the face work at all bonding courses and at joints where metal ties are used in lieu of masonry bond. Chases and raked-out joints shall be kept free from mortar or other debris. Spaces around metal door frames and other built-in items shall be solidly filled with mortar. Anchors, wall plugs, accessories and other items required to be built-in with masonry shall be built-in as the masonry work progresses.

(2) Brick. - Brick shall be damp when laid. Brick shall be shoved into place, not laid, in a full bed of unfurrowed mortar. All horizontal and vertical joints shall be completely filled with mortar when and as laid. Vertical joints shall be all of the same width except for inconspicuous variations required to maintain the bond and as noted on drawings.

(3) Chimney. - Chimney shall be built of brick lined with terra cotta flue lining of the sizes shown on the drawings and extending from one foot below the smoke inlet the full height of the flue and a distance of not less than one inch above the chimney cap of the Utility Buildings and one inch above concrete wash of the Operators' Quarters chimney. Mortar for joints of flue lining shall be made with refractory cement - low temperature grade, and struck smooth inside. The space between the lining and the masonry shall be filled solidly with mortar. Linings shall be built-in as the work progresses.

(4) Joints. - Exposed face of brickwork masonry unit walls shall be laid with joints concave. Unless otherwise indicated on the drawings or specified, mortar joints shall be not over 3/8-inch wide. All joints shall be formed with suitable tools. Joints shall be tooled in such manner as to squeeze the mortar back into the joints. No tooling shall be done until after the mortar has taken its initial set.

d. Pointing. - At completion of the work, all holes in joints of exposed masonry surfaces shall be pointed by completely filling with mortar of color to match the adjacent work.

e. Cutting and Patching. - Cutting and patching of brick masonry, as required to accommodate the work of others, shall be performed by masonry mechanics.

f. Unfinished Work. - Unfinished brick work shall be stepped back for joining with new work; toothing may be resorted to only when specifically approved by the Contracting Officer. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly wetted not less than 12 hours before laying new work.

g. Protection of Finished Work. - Surfaces of masonry not being worked on shall be properly protected at all times during the construction operation. The tops of exposed masonry walls and similar surfaces shall be covered with a strong waterproof membrane well secured in place when the work is stopped at the end of the day, or otherwise interrupted, or when rain or snow is imminent.

h. Calking. - Calking compound shall conform to Federal Specification TT-C-598 for gun application. Calking shall be installed where indicated or required. In addition to applying sealer, a coating of the sealer shall be applied to the surface of the calking compound prior to finish painting.

i. Pointing and Cleaning. - At completion of the work, holes in joints of exposed exterior masonry surfaces shall be filled with mortar and suitably tooled. After pointing has set and hardened, exposed masonry surfaces shall be cleaned with stiff fiber brushes, leaving the masonry clean, free of mortar daubs, and with tight mortar joints throughout. Immediately after cleaning, the masonry surfaces shall be thoroughly rinsed down with clean water.

34-08. SHEET METAL WORK AND MISCELLANEOUS METALS. - All structural steel and miscellaneous metals shall conform to the applicable requirements of Section 30, METAL, MISCELLANEOUS MATERIALS AND STANDARD ARTICLES, with the following additions:

a. Materials. - (1) Anchor bolts for anchoring the sills to the foundation walls shall be 1/2-inch diameter, 12 inches long, spaced on four foot centers, unless otherwise indicated on the drawings. The projecting portion shall be given a coat of red lead.

(2) Nails. - Nails for sheet metal work shall conform to the requirements of Federal Specification FF-N-101 for "Nails, Spikes, Staples and Tacks" and shall be not less than 0.109-inch diameter. Nails shall be of the large-head type and shall be of sufficient length to firmly secure the materials in place but not so long as to penetrate finished surfaces of sheathing at eaves. Non-ferrous nails shall be hard copper or copper alloy. Ferrous nails shall be hot-dip galvanized steel.

(3) Insect Screen Cloth. - Insect screen cloth shall conform to the requirements of Federal Specification RR-S-141a, for "Screening, Wire, Insect", Type II, and shall be 18 x 18-mesh.

(4) Screws. - Screws for sheet metal work shall conform to the requirements of Federal Specification FF-S-111a, for "Screws, Wood, Slotted-Head" and shall be of the type required to properly secure the wood. Non-ferrous screws shall be hard copper or copper alloy; ferrous screws shall be of steel, galvanized.

(5) Solder. - Solder shall conform to the requirements of Federal Specification QQ-S-571b, for "Solder (Tin, Tin-lead and Lead-Silver)", Composition 50 sn. Flux shall be rosin except where prohibited by unusual conditions of application, in which event soldering flux paste conforming to the requirements of Federal Specification O-F-50c, for "Flux, Soldering; Paste" or muriatic acid properly killed with zinc may be used.

b. Soldering and Seaming. - (1) Soldering. - All edges of uncoated sheet metal to be soldered shall be pretinned before soldering is begun. Soldering shall be done slowly with well-heated copper so as to thoroughly heat the seam and completely sweat the solder through the full width of the seam. Ample solder shall be used and the seam shall show not less than one full inch of evenly flowed solder.

(2) Seams. - (a) Flat Lock Seams. - Flat lock seams shall finish not less than 3/4-inch wide.

(b) Soldered Lap Seams. - Soldered lap seams shall finish not less than one inch wide.

(c) All Seams. - All seams shall be made in the direction of the flow.

c. Downspouts and Flashings. - (1) Downspouts. - Downspouts shall be of 16 ounce copper of the design and sizes indicated. Downspouts shall be provided in one length, shall be set plumb and clear of the wall by straps, not less than 1/8-inch thick by 1-1/2 inches wide, soldered to the downspout and firmly secured to supporting construction with brass screws. Straps shall be placed at top and bottom of downspouts. Elbow offsets shall be provided as indicated or required. Wire basket strainers of 14 gage copper wire shall be set in loosely in all gutter openings into downspouts.

(2) Flashings. - Flashings shall be installed at all intersections of roofs with vertical surfaces, at all projections through roofs except at plumbing pipe vents, and elsewhere as shown on the drawings or required, to provide watertight protection. Exposed edges of all flashings shall be folded back 1/2-inch to provide stiffness. All flashings shall be of 16-ounce copper unless otherwise specified. Except as otherwise specified or indicated on the drawings, cap flashings shall be provided over all base flashings.

(a) Base Flashings. - Base flashings shall be constructed of 20-ounce copper and shall extend up vertical surfaces not less than 8 inches and out on the roof, or horizontal surface, not less than 4 inches. On sloping roofs they shall lap lengthwise not less than 3 inches. Installation of base flashings for shingle roofing shall be coordinated with roofing work. The edges of base flashings on wood roofs shall be held in place on the roof side, by copper nails spaced 3 inches on centers.

(b) Cap Flashings. - Cap flashings shall be of 16 ounce copper. Cap flashings shall turn down over base flashings not less than 4 inches.

Cap flashings in masonry shall extend into the masonry not less than 3-1/2-inches and shall terminate with a 1/2-inch folded edge. The cap flashing shall be formed to provide spring action against the base flashing.

(c) Stepped Flashing. - Stepped flashing, occurring where the sloping surfaces intersect with vertical masonry surfaces, shall be stepped up the slope in sections of the length indicated on the drawings or required. The stepped flashing at vertical joints between the sections shall be lapped not less than 3 inches. Where sides of asphalt shingle roofing abut vertical surfaces, the base flashings shall be woven into the courses. Joints between edges of shingles and flashings shall be filled with plastic cement.

(d) Wall Flashing. - Wall flashing shall be installed where shown on the drawings. Flashings in walls, for such items as sills and heads of openings, shall be of 16 ounce copper and shall conform to the details shown on the drawings. Flashing at openings shall extend not less than 4 inches beyond the jambs of the opening. Wall flashings shall be installed, as required, to provide watertight construction.

(e) Metal Rain Diverter. - Metal rain diverter shall be of size and type as approved, shall be 16 ounce copper, and shall be installed in plastic cement over the shingles with suitable nails.

(f) Metal Lining for Planter. - Metal lining for planter in living room of Operators' Quarters shall be fabricated of 20 ounce copper and installed to provide a completely waterproof lining.

d. Metal Clad Door and Frame. - (1) Door. - Door shall be constructed of cores consisting of 3 layers of 7/8-inch thick selected, kiln-dried tongue-and-grooved, white or sugar pine, with each ply lined with asbestos paper. Stiles and rails shall be of solid stock to the full thickness of the door and of width shown on the drawings. The plies shall be laid at right angles to each other and clinch-nailed together. Sheet metal covering shall be stretcher-leveled, No. 28 gate steel or ingot iron and shall be tightly rolled or drawn on the surfaces without buckle, and in a manner that will insure permanent contact with the cores. All edges shall be sharp, straight and true. All joints or seams shall be soldered or welded, and ground smooth, except that at the edges of the doors the covering on both faces may lap each other with a heavy band set in a groove and fastened with screws, 4 inches on centers. Nails shall be zinc-coated and shall not be left exposed. All surfaces shall be primed with one shop coat of red-lead paint. All hardware for the metal-covered door shall be shop-installed. The hardware to be furnished shall conform to the requirements of a Class A door and shall include an automatically closing device and a latch arranged for padlocking. Installation including hardware and operational characteristics shall be in accordance with National Fire Protection Association Pamphlet No. 80 (current issue).

(2) Frame. - Frame for door shall be structural steel channel of the size indicated and notched for hardware. Stop shall be of structural steel bar stock welded to channel. Frame shall be provided with three anchors to each jamb. Reinforcement for hardware shall be welded to the web.

e. Metal Ventilator. - A metal ventilator with metal base, damper and fusible link shall be installed in the fireproof room of the utility building at the ceiling and extending through the roof.

f. Wire Grille. - Fabric for wire grille shall be woven of high carbon or manganese steel conforming to Federal Specification QQ-W-461b for "Wire, Steel (carbon;) Bare and Coated", grades FS 1035 and FS 1045. Wire shall be 10-gage, woven into 1-1/2-inch diamond mesh.

g. Miscellaneous Sheet Metalwork. - Sheet metal items not covered elsewhere in this section shall be as indicated on the drawings and as required to provide a watertight installation. Formed sheet metal for metal-covered work shall accurately reproduce the detail and design shown, and profiles and intersections shall be sharp, even, and true. Joints shall be locked or lapped, and soldered, as applicable. Reinforcements shall be provided as required.

h. Weatherstripping. - Materials in connection with weatherstripping shall be No. 9 gage standard sheet (not ribbon) zinc, cut across the grain. Bronze where used shall be not less than 32 B&S gage, pressure rolled for resiliency to a hardness especially suited for the purpose intended. Weatherstripping shall not react against type of threshold furnished.

i. Aluminum Ladder. - The contractor shall furnish a 26-foot aluminum extension ladder in utility building and shall install metal hangers therefor where directed. The ladder shall be similar and approved equal to "Duraladd" aluminum ladder manufactured by F. B. Jones Manufacturing Co. (Factory Branch), Somerville 44, Mass., and shall be equipped with safety shoes.

j. Metal Combination Storm and Screen Doors. - The contractor shall furnish and install aluminum combination doors complete with frames with interchangeable screen and glazed panels for the exterior door to office of the Utility Building, and for front and rear entrances of Operators' Quarters. Metal storm doors shall be of approved design and manufacture. They shall be fabricated completely by extruded heat-hardened and anodized aluminum sections and panels. Doors shall be 1-inch thick. All corners shall be neatly mitered and held together with heavy duty die cast non-ferrous metal inserted or other approved method. All other joints and connections shall be secured to give a permanent and rigid joint or connections. Screens shall be fabricated of extruded sections and screen cloth shall be aluminum 18 x 18-mesh. Frames shall be of a type that permits rescreening. Vinyl strip shall be placed at bottom. Storm glass section shall consist of an extruded frame and double strength glass set in neoprene. Doors shall be hung on piano hinge full height of door conforming to requirements of door manufacturer. Doors shall have hand latch and keeper on jamb. Doors shall be fitted and hung and demonstrated to operate perfectly. Door closers shall conform to Fed. Spec. FF-H-121c and shall be Type 3015. Doors shall be installed within their own aluminum frame securely fastened to door jambs and heads.

k. Mirrors. - Plate glass mirrors shall be furnished and installed over each lavatory in the Utility Buildings. Bottom of mirrors shall be 4'6" from floor, unless otherwise directed. Mirrors shall conform to Federal Specification DD-M-411, Grade I (copper-backed) Class E, modified for size 14" x 24".

l. Cabinet for Paper Towels. - One cabinet for paper towels shall be installed in each toilet room of the Utility Building, where directed. Cabinets shall conform to Federal Specification WW-P-541b, type 445.

m. Metal Toilet Enclosures and Partitions. - Flush type metal toilet enclosures and partitions and screen and urinal partitions shall be furnished and installed in the toilet rooms of the Utility Building where indicated. The work shall include all fastenings, fittings and hardware for a complete and satisfactory installation. The enclosures and partitions shall be the good quality product of a reputable manufacturer and shall be approved prior to delivery to the site. All sheet metal shall be cold-rolled, galvanized, bonderized, stretcher-leveled, furniture steel stock. Enclosure doors shall swing in and each enclosure shall be fitted with hinges, a throw latch, a combination hook and bumper, and a toilet paper holder. Toilet paper holders shall be roll type, standard with the manufacturer. All surfaces shall be cleaned and factory finished with baked-on primer and finish coats, color to be selected from manufacturer's standard colors.

n. Metal Louvers. - Metal louvers shall be fabricated of 20 gage aluminum. Louver frames shall be constructed as to provide a watertight seal between frame and wall. Louvers shall be provided with non-ferrous type insect screen, 18 x 18-mesh.

o. Metal Lavatory Shelves. - A metal shelf shall be provided over each lavatory in the toilet rooms of the Utility Building. Shelves shall conform to Federal Specification WW-P-541b, Type 426M, or approved equal. Brackets shall be secured with countersunk, oval head, tamper-proof chrome plated screws. In masonry construction, screws shall be set in fiber anchor plugs. Shelves shall be set 3'-11" from floor unless otherwise directed.

p. Bulkhead. - The metal bulkhead door for entrance to basement of Operators' Quarters shall be similar and approved equal to Bilco steel basement door, Size C. Door shall be furnished with manufacturer's baked on prime coat.

q. Medicine Cabinet. - One recessed medicine cabinet with mirror door and fluorescent lights shall be provided over lavatory in the bathroom of the Operators' Quarters. Cabinet shall require wall opening of approximately 16 inches by 22 inches. The cabinet shall be similar and approved equal to Miami Carey Model No. 650-30. Mirror shall be 18" x 24".

r. Chimney Cleanout Doors. - Chimney cleanout door of approved size shall be provided and shall be cast iron conforming to Federal Specification QQ-I-652, Class 25 or 30, complete with frames, and unless otherwise indicated sized to match flue. Frame shall have anchors and a continuous flange for fastening into masonry. Door shall be hinged and shall have fastening device. Shop drawings shall be submitted.

s. Concrete-Filled Pipe Columns. - Pipe for concrete-filled steel pipe columns shall be 3-1/2-inch diameter, extra strong weight steel pipe conforming to the requirements of ASTM A53-58aT, grade B, mill tested steel pipe cut and slotted to receive connections with a minimum yield point of 35,000 p.s.i. The pipe shall be furnished filled with concrete. Pipe columns shall be provided with all required caps and bases. Pipe columns, caps and bases shall be erected in accordance with the details shown on the drawings. Shop drawings shall be submitted.

t. Metal Thresholds. - (1) Operators' Quarters. - Metal thresholds shall be installed for all exterior doors to Operators' Quarters and where shown on drawings except basement door. They shall be non-ferrous interlocking type size as indicated and shall accommodate bottom hook strips furnished. Threshold shall be bedded in an approved mastic. All thresholds shall extend full distance between door jambs. Ends of thresholds shall be furnished with necessary cutouts to fit door jambs. Secure thresholds in place with 1/4-inch diameter countersunk non-ferrous screws one at each end intermediately spaced not over 12-inches on centers.

(2) Utility Building. - The thresholds of the exterior doors of the Utility Building where indicated on door schedule shall be the interlocking weatherstrip type, 5-1/2" x 5/8", fabricated from nonferrous metal with a non-slip top surface and shall be bedded in calking compound and anchored to the concrete by means of bolts set in expansion sleeves.

u. Clothes Poles. - The contractor shall provide in all the coat and clothes closets a 3/4-inch inside diameter, standard weight, galvanized steel pipe conforming to the requirements of Federal Specification WW-P-406. The pipe except as otherwise required, shall be attached to the wall at each end with a flanged fitting and screws. In addition, the pipe shall be supported from the center with a metal hanger secured to the closet shelf. In closet where scuttle to attic space occurs, pole installation shall permit easy removal without use of tools.

v. Wrought Iron Hand Rails. - Exterior wrought iron hand rails for Operators' Quarters shall be of the sizes and types indicated on drawings. Wrought iron shall conform to requirements of Federal Specification QQ-I-686, of the grade best suited. Hand rails shall be installed in a sturdy and durable manner as approved by the Contracting Officer. Shop drawings shall be submitted.

w. Extension Traverse Rods. - Provide one extension traverse rod, length adjustable from 12 feet to 16 feet, and install in living room of Operators' Quarters so as to span the three awning combination windows. Provide two extension traverse rods, length adjustable from 50 inches to 86 inches, and install so as to span each pair of awning windows in bedrooms 2 and 3 of Operators' Quarters. All traverse rods shall be manufacturer's standard residential type and similar and approved equal to Kirsch residential type and shall have center close

two way operation, adjustable projections from 2-1/2-inches to 3-1/2-inches minimum, snap on end brackets, ball bearing tension pulley suitable for floor mounting, continuous braided cotton fiberglass core pulley cord, and shall be galvanized bonderized and finished with white or ivory baked enamel. The large traverse rod shall have at least two intermediate supports and a minimum of 56 nylon carriers. The smaller rod shall have at least 20 nylon carriers. Fastenings for attachment of brackets shall be plated steel screws of proper length and type. Toggle bolts shall be used for mounting.

x. Heater Room Door (Interior door). - The interior door and frame for the heater room in the Utility Building shall be either hollow metal or kalamein type for a class B door. Label will not be required; however, certificate of compliance shall be submitted.

y. Robe Hook. - Robe hook conforming to Federal Specification WW-P-00535 figure 3, shall be installed on bathroom door in Operators' Quarters and mounted 66 inches above floor. Hook shall be installed on lockplate.

z. Basement Windows. - Basement windows of the Operators' Quarters shall conform to Steel Window Institute Recommended Standards for Steel Windows, basement type. Ventilators shall be hinged at bottom to project in and shall be provided with outside insect screening of nonferrous 18 x 18-mesh type. Standard hardware shall also be furnished.

34-09. CARPENTRY. - a. Lumber and Woodwork. - Lumber shall conform to Federal Specification MM-L-736 for "Lumber and Timber, Hardwood", and MM-L-751c for "Lumber and Timber, Softwood". A certificate of conformance with Federal Specifications will be accepted in lieu of inspection requirements. At the contractor's option, lumber for the various uses shall be one of the species listed for the purpose and of the grade indicated.

(1) Rough Carpentry:

	SPECIES AND GRADE		
	Douglas Fir Sitka Spruce Western Red Cedar	Northern White Pine Eastern Spruce	White Fir
Column and Posts, Roof Trusses	Any stress-graded species -1,450 f., 1,075 c., 1,540,000 E. (Unless otherwise indicated on the drawings).		
Rafters, Sills, Joists, Headers and Stair Carriages	Any stress-graded species. - 1100 f., 850 c., 1,320,000 E. (Unless otherwise indicated on the drawings).		
Studs, Plates, Caps, Nailers	Standard	No. 2	No. 2
Subflooring and Roof Sheathing	Standard	No. 3 Boards	No. 3
Wall Sheathing, Bridging Ridge Boards, Bracing, and Furring	Standard	No. 3 Boards	No. 3
Subfloor - Bathroom	Exterior type, Grade C-C (Plugged Ext)		

(2) Exterior Finished Carpentry:

	SPECIES AND GRADE	
	Douglas Fir Sitka Sprice Western Red Cedar	Northern White Pine Redwood Eastern Spruce
Cornices	C and better	C Select
Trim and Corner Boards	C and better	C Select
Window and Door Frames	Practically clear material without obvious defects. Window jambs, parting strips, and sills of Douglas fir, and sills of Sitka spruce shall be VG or EG. Door frames shall be of second grade for paint finish.	Practically clear material without obvious defects. Window jambs, parting strips, and sills of Douglas fir and sills of Sitka spruce shall be VG or EG. Door frames shall be of second grade for paint finish.
Gutters	Best Grade	

(3) Interior Finished Carpentry:

	SPECIES AND GRADE Douglas Fir Sitka Spruce Western Red Cedar	 Northern White Pine Redwood Eastern Spruce
Trim	Highest grade for natural finish; second grade for paint finish. Wood for natural finish shall be uniform in color.	
Moldings	Standard Moldings	B and better Moldings
Shelving	No. 2 Boards	No. 1 Boards
Wainscot (146T & G)	No. 2 Stock	No. 1 Stock
Stair Treads and Risers	Construction	No. 1

(4) Flooring (Operators' Quarters):

	Oak Red or White	Beech, Birch Maple, Pecan
Living Room, Dining Room and Halls, including hall closet	Select (Plain Sawed)	Second
Bedrooms and Bedroom closets	No. 1 (Plain Sawed)	Second
Thresholds (front door)	Select grade (CS 56-49) Oak, Red or White to Match Flooring	
Thresholds (rear door)	Longleaf Southern Pine, Grade No. 1	
Kitchen (under linoleum)	Douglas Fir Commercial Standard CS 45-55, Ext. Type, Grade C-C (Plugged) Ext.	

b. Other Materials. - (1) Tempered Pressed Wood Fiberboard. - Tempered pressed wood fiberboards shall conform to the requirements of Federal Specification LLL-H-35 for "Hardboard, Fibrous-Felted (Fiberboard)", 3/16-inch thick, Type II.

(2) Gypsum Wallboard. - Gypsum wallboard shall conform to Fed. Spec. SS-W-51a, 1/2-inch thick, unless otherwise indicated or specified.

(3) Batt- and Blanket-Type Insulation. - Federal Specification HH-I-515, Class A, treated for fire-resistance rating of slow burning or better, with vapor barrier membrane and edges suitable for nailing insulation between supporting members; HH-I-521c, Type I, Class B or C.

(4) Laminated Aluminum Foil Insulation shall be an open mesh glass fiber reinforcing mesh on flame-proofed paper.

(5) Roofing Shingles. - Roofing shingles shall conform to Federal Specification SS-R-521 for "Roofing and Shingles; Asphalt, Prepared, Mineral Surfaces", Type II.

(6) Waterproof Sheathing Paper. - Waterproof sheathing paper shall conform to Federal Specification UU-P-147b for "Paper; Building, Waterproof", Type I, Class B.

(7) Lag Screws. - Lag screws shall conform to Federal Specification FF-B-561a for "Bolts; Lag".

(8) Bolts, Nuts and Studs. - Bolts, nuts and studs shall conform to Federal Specification FF-B-571a for "Bolts; Nuts; Studs; and Tap Rivets (and Material for same)".

(9) Nails. - Nails shall conform to Federal Specification FF-N-105 for "Nails; Wire and Staples".

(10) Screws. - Screws shall conform to Federal Specification FF-S-111a, for "Screws; Wood, Slotted-Head".

(11) Clamps, etc. - Clamps, expansion bolts, expansion screws, washers and anchors shall be of steel or iron and of standard type and manufacture as approved.

(12) Asphalt Saturated Felt. - Asphalt saturated felt shall conform to Federal Specification HH-F-191a for "Felt; Asphalt-saturated (for) Flashings, Roofing, and Waterproofing".

(13) Glass. - Glass shall conform to Federal Specification DD-G-451a for "Glass, Flat and Corrugated for Glazing, Mirrors and Other Uses".

(14) Calking Compound. - Calking compound shall conform to the requirements of Federal Specification TT-C-598 for "Compound, Calking; Plastic (for) Masonry and Other Structures".

(15) Plywood for building exterior including soffits shall be exterior type conforming to CS 45-55, Grade A-C for natural finish and Grade B-C for painted surfaces, thickness as indicated except that grooved plywood siding for Operators' Quarters shall be "Texture III" as specified by the Douglas Fir Plywood Association.

c. Framing and Boarding. - (1) Lumber and Other Rough Work. - Lumber and other rough work shall be properly framed, closely fitted, accurately set to the required lines, and rigidly secured in place. No shims will be allowed on wood or metal bearings. Studs and joists shall be sized to give true surfaces for finish. Framing shall be kept at least 2 inches away from the chimney. Members shall be framed to allow for passage of pipes to avoid cutting of structural members. No members shall be cut, notched, or bored for the passage of such pipes without prior approval. Wall plates shall be built up of two thicknesses of lumber with joints broken. All corners shall be wind braced. Ridges shall be straight and true intersections of the roof planes. Rafters on plates and ridges shall be framed with close joints. Blocking not less than 2 x 4-inch stock or size of framing member shall be placed between rafters, joints, and studs where necessary, indicated, or directed, to form nailings for roof and wall sheathing, and subflooring. Ceiling joists shall be lapped and spiked together at bearings and spiked to studs where same occur. Openings shall be framed with headers and trimmers. Headers carrying more than one tail-joist shall be tripled. Furring and strapping shall be 1" x 3" strips spaced as indicated on the drawings and installed transversely to ceiling joists and walls, and shall be provided around all openings, angles, corners and elsewhere as required. Bridging shall be provided where shown.

(2) Trussed Rafters. - The trussed rafters for the Utility Buildings shall be fastened with timber connectors conforming to the following requirements: Split rings shall be manufactured from hot rolled S.A.E.-1010 carbon steel, 2-1/2 inches in diameter. Each ring shall form a closed true circle with an outside cylindrical surface parallel to its axis. Split rings shall be cut through in one place in its circumference to form a tongue and slot. The dimension of the rings shall be as follows:

Inside diameter when closed	2.50"
Depth of ring	3/4"
Thickness of metal with inside surface beveled edge	0.163"
Beveled center	0.163"

Bolts shall be machine bolts 1/2-inch in diameter. Plate washers 2" x 2" x 1/8" shall be used on both sides of the joint. The groove for the ring shall have an inside diameter of 2/56 inches, a depth of 0.37 inch and a width of 0.18 inch.

(3) Wall and Roof Sheathing. - Wall and roof sheathing shall be dressed and matched and laid in level courses well driven up, at every bearing. Joints shall be over supports with not less than two boards between joints on same support. Roof surfaces of every kind shall conform to roof lines and slopes shown on the drawings or required. Waterproof sheathing paper shall be installed over wall sheathing and wood subfloors.

(4) Studs. - Studs shall be 2" x 4", spaced 16 inches on centers, unless otherwise shown. Plates and sills resting on concrete walls shall be anchored in place with 1/2-inch bolts. Studs shall be built up double round openings and trussed over all doors and windows. Corners shall be thoroughly spiked together and made solid. All bearing partitions shall be provided with top and bottom plates. Partitions and walls shall have at least one row of horizontal bridging full width of studding, cut and securely nailed unless additional bridging is indicated. Studs shall be framed as shown or required for the proper installation of trim, plumbing, and other work to be concealed. Nailing strips shall be cut as required for the support of fixtures of all kinds. Partitions carrying soil pipe shall be furred out for same.

(5) The contractor shall provide three stringers of 2-inch stock, cut to exact shapes required to receive finish treads and risers for basement stairs. Risers shall be of uniform height and treads of uniform width. All trimmers blocking and other framing shown or necessary to provide support for the finish treads and risers shall be installed. Finish stairs shall have 7/8-inch treads with nosings, and 7/8-inch risers nailed direct to rough stringers.

(6) Subflooring shall be of 1 x 6-inch, or 1 x 8-inch dressed and square-edged material. Subflooring in bathroom shall be laid diagonally. Butt joints shall be staggered and over supports, with ends cut parallel to joists. Two nails, not smaller than tenpenny, shall be used at each bearing. Boards shall be face-nailed with nail heads well set. Subflooring to receive nailed wood flooring shall be covered with rosin sized paper.

(7) Subflooring, minimum thickness 5/8-inch, shall be installed in bathroom with grain of face plies across the joists. End joints shall be butted over supports. Plywood shall be nailed 4-inches on centers along edges and ends and 6-inches on centers along all intermediate bearings using 1-3/4-inch annular or screw type nails.

(8) Underlayment for linoleum over wood subflooring shall be plywood. Underlayment shall be secured to the subfloor with 1-1/4-inch screw type or annular-ring-type nails, 1-3/8-inch cement-coated sinker nails, or 7/8-inch long, No. 18 gage etched or galvanized divergent point staples as recommended by the manufacturer of the staples. Plywood shall be not less than 3/8-inch thick, exterior type, grade C (Repaired)-C. Nails or staples shall be spaced 6-inches on centers at edges of panels and 8-inches on centers in both directions in the field of panel.

d. Insulation. - (1) Soundproof partitions shall have not less than 2-inches of blanket insulating material installed between the staggered studs where shown. The insulation shall be securely nailed to alternate studs. Elsewhere, insulation shall be installed as specified for thermal insulation.

(2) Thermal Insulation. - Thermal insulation shall be placed where shown on drawings, and to the indicated thicknesses, in accordance with the manufacturer's recommendations. Batts shall be placed between ceiling joists, unless otherwise indicated.

(3) Reflective Insulation. - Reflective insulation of the laminated aluminum foil open mesh glass fiber reinforcing mesh type on flame proofed paper shall be installed behind base board radiators.

e. Exterior Finish. - (1) All exterior finish shall be milled from materials specified and erected in strict conformity with details. The exposed surfaces of finish woodwork shall be smooth and ready to receive paint or other finish. All nailing shall be blind or face nailing as required with face nails set for putty-stopping. Cornice and other exterior trim and millwork shall be constructed so that water cannot pass through the joints. Molded work shall be coped at returns and interior angles and mitered at corners. Intersections of flat work shall be shouldered. Moldings shall be run to exact profiles shown on details. Rake mouldings shall be run to profile required to miter with horizontal moldings. Plywood shall be installed where indicated.

(2) Grooved plywood siding shall be equal to "Texture One-Eleven" as specified by the Douglas Fir Plywood Association and shall be installed according to the details shown on the drawings and as recommended by the above association.

(3) Wood shingles shall conform to Commercial Standard CS 31 and shall be of random width and 16 inches long. Shingles shall be applied single-coursed, and maximum weather exposures shall be 7-1/2-inches. Shingles shall be secured with corrosion resisting three penny nails, driven approximately one inch above the butt line of the next course to be applied and approximately 3/4-inch from each edge, with a third nail in the center of the shingle. Joints between shingles in adjacent courses shall be broken or kept out of vertical alignment at least 1-1/2-inches. The starting course at base of wall shall be doubled. All shingles shall be predipped as specified under PAINTING section.

f. Wood Louver Ventilators. - Wood louver ventilators shall be built as indicated on the drawings. Insect screens on frames and removable covers shall be provided in back of louvers.

g. Window Frames. - Window frames shall conform to the following requirements. (Shop drawings shall be submitted).

(1) Double-hung frames shall have 3/4-inch jambs, heads, and blind stops, 1/2- by 3/4-inch parting strips, 1-5/8-inch sills and 1-1/8-inch side and head casings. Jambs or heads shall be cut as required by the type of spring balances specified. Inside stops shall be secured with screws and adjusters. Sills shall be run with weather breaks on top and one or more grooves on bottom as shown. When staff beads are required, they shall be loosely attached.

(2) Awning Frames. - Awning frames shall have 1-3/8-inch jambs and heads and 1-5/8-inch sills. Sills shall be run with weather breaks on top and one or more grooves on bottom as shown. Frames shall be cut or worked as required to receive operating hardware. When staff beads are required they shall be loosly attached.

(3) Mullions. - Mullions shall be constructed to the size shown or required.

h. Sash. - Sash shall be of the type and design indicated. Nominal thickness of double-hung sash shall be 1-3/8-inches for Operators' Quarters and Garage and 1-3/4-inches for Utility Building, and all awnings, fixed and hopper sash shall be not less than 1-5/8-inches. Ponderosa Pine sash 1-3/8-inches and less in thickness shall conform to CS 163-59, and 1-3/4-inch-thick sash shall be equal in construction and quality. Sash of Douglas fir, cypress, or southern pine shall be of the same construction and quality as specified for Ponderosa Pine. Double-hung sash shall be check-rail type, shall be grooved for attachment of spring balances, and when over 3 feet 4 inches wide, bottom rail of upper sash shall be rabbeted the full length and reinforced with a zinc-coated steel angle not less than 1 inch by 1-1/2-inches in size. Awning type sash shall be furnished complete with all operating hardware and weatherstripping. Sash shall be fitted closely after frames are set, shall be made to work free and easy, and shall be well-balanced. All windows except those in basement and unheated spaces shall be weatherstripped in accordance with CS204-59 and CS 190-59 as applicable. Sash in toilet rooms in Utility Building shall be glazed with Type IIIc, rolled figured obscure glass, and all other sash except awning type windows of Operators' Quarters shall be glazed with Type II, B quality, double-strength, clean glass conforming to Federal Specification DD-G-451a for "Glass; Flat and Corrugated (for) Glazing, Mirrors and Other Uses". All glass shall be set in best quality putty. Glass for all awning combination and awning type windows in Operators' Quarters shall be double strength B quality, clear sheet glass and shall be of the multiple-pane insulating type consisting of two lights which are separated by dehydrated air spaces hermetically sealed.

i. Storm Sash. - Storm sash for double-hung windows shall be of the same construction as specified for window sash, except 1-1/8-inch thick. The sash shall be of the full height of the opening with the center horizontal division the same width as the check rail of the window sash and aligned with same. Storm sash shall be provided for all double-hung windows in the Operators' Quarters and for all double-hung windows in Utility Building except in heater room and dead storage space. Storm sash shall be provided for all awning type windows in the Utility Building, type as provided by the window manufacturer. Sash shall be glazed with Type II, double-strength, B quality glass.

j. Insect Screens. - (1) Insect screens (half screens) of 16-mesh non-ferrous screen cloth shall be provided for all double-hung windows in the Utility Building and in Operators' Quarters except for

windows in dead storage and workshop areas. The window openings shall be provided with aluminum channel slides properly installed. Window screen frames shall be of 3/4-inch stock with top rails and stiles 1-1/2-inches wide and bottom rails 2 inches wide.

(2) Awning and hopper type windows shall be provided with metal framed screens as provided by window manufacturer.

k. Door Frames. - Exterior door frames shall be 1-3/4-inches thick, double-rabbeted from the solid for doors and combination metal storm and screen doors, unless otherwise shown. Interior door frames shall be 1-3/8-inch thick, full width of finished wall or partition and shall be double-rabbeted from the solid and secured with finish nails. Double wedge blocking shall be driven back of jambs at nailing points and at back of butts and lock strikes.

l. Doors. - (1) General. - Doors shall be of design and sizes indicated and shall be fabricated in accordance with the best practice of the trade, with all joints properly formed, tightly fitted and tenoned. Exterior doors shall be flush, paneled or glazed as shown, 1-3/4-inch thick. Glass shall be type II, double-strength, B quality. Louver shall be provided for door to men's toilet in Utility Building. All exterior doors, (except overhead doors, door to heater room in Utility Building, and garage swing door) shall be completely weather-stripped. Heater room door in Utility Building shall be weather-stripped at door bottom only. Strips shall be as wide as the door will allow and secured by nails spaced not more than 1-inch apart. Interior doors shall be 1-3/8-inch except as otherwise indicated. Door with wire-grille shall be constructed of 2 x 4's with joints half-lapped. Grille shall be fastened to door with staples on 6" centers and a 1" x 2" wood strap laid over and firmly nailed on 4" centers.

(2) Swing Doors. - Top and bottom edges of doors shall be given two coats of spar varnish at the factory before shipment. Exterior doors shall be fabricated with water-resistant adhesives.

(a) Exterior paneled doors shall be softwood doors. Panels may be solid or laminated; laminated panels shall be not less than 3-ply, and when raised, face veneers shall be of sufficient thickness to take the raising. Doors shall have solid stiles and rails. Softwood doors of Ponderosa Pine shall conform to CS 120-48, grade 2; of Douglas fir, Sitka spruce, or western hemlock shall conform to CS 73-61, grade B; of redwood, cypress, or southern pine shall be equal in construction and quality to the corresponding grades of CS 120-48 or CS 73-61.

(b) Exterior flush doors shall be softwood-veneered and shall have solid cores of the stile-and-rail type. Doors, when constructed without cross-banding, shall have sawn or sliced face veneers not less than 3/16-inch thick before sanding, and when cross-banded,

combined thickness of cross-banding and face veneer on each face shall be not less than 3/16-inch before sanding. Otherwise, softwood-veneered doors of Ponderosa Pine shall conform to CS 120-48, grade 1; of Douglas fir, Sitka spruce, or western hemlock shall have vertical grain faces for paint finish and construction and quality shall be equal to those required by CS 91-41.

(c) Interior flush doors of Utility Building shall be softwood-veneered solid-core doors; Interior flush doors of Operators' Quarters shall be hardwood-veneered hollow-core doors.

1. Solid-core doors may have wood cores or composition cores at the option of the contractor.

(i) Wood-core doors may be of the vertical-block type or the stile-and-rail type at the option of the contractor. Softwood-veneered doors of Ponderosa Pine shall conform to CS 120-58, grade 1; of Douglas fir, Sitka spruce, or western hemlock shall have vertical-grain faces for paint finish and construction and quality shall be equal to those specified for pine doors.

(ii) Composition-core doors shall have a core composed of inert mineral substances which when processed shall weigh not more than 28 pounds per cubic foot and have a moisture content not in excess of 6 percent, and shall consist of three or more pieces securely bonded together and to the stiles and rails. Stiles and rails shall be of laminated hardwood and shall have a nominal width of 1-1/2-inches and 4-1/2-inches, respectively. One lock block not less than 4 inches wide shall be provided and its location suitably indicated. The core shall be sized to provide a suitable base for gluing. Cross-banding shall be not less than 1/16-inch thick, and face veneer shall be hardwood not less than 1/28-inch thick, each applied with waterproof glue.

2. Hollow-core doors shall conform to CS 171-58, grade "Good Grade". Type of core construction shall be at the option of the contractor.

(3) Overhead Door for Garage. - Door for garage shall be sectional overhead and of size as indicated on the drawings, and shall be constructed of 1-3/8-inch thick, mortised and tenoned, glued, steel doweled, stiles and rails with rebated weather joints throughout. Stiles shall be 3-1/2-inches wide at centers and 5-1/2-inches wide at ends. Center rails shall be 2-9/16" minimum, and top and bottom rails shall be 5-1/2-inches wide. Door shall be furnished with rubber weather-strip at bottom. Door panels shall be 1/4-inch thick exterior grade plywood. Provide fixed glazed openings in door as indicated on drawings, and glaze with double-strength, B quality, clear glass bedded in elastic glazing compound. Counter balancing hardware shall be torsion-spring type on cross header steel shaft. All metal parts such as tracks, guides, bracing and hardware shall be furnished with the door to complete the

installation. Tracks shall be 2-inch size and furnished for a 10-inch maximum head radius with adjustable jamb brackets on the verticals. All metal parts shall be galvanized steel. Door sections shall be hinged at rail center stile and end stile. Door shall be erected in accordance with manufacturer's instructions.

(4) Overhead Doors for Utility Building.- Overhead doors for Utility Building shall conform to the requirements for overhead garage door, except as follows:

(a) Doors shall be 1-3/4-inches thick.

(b) Doors shall be provided with left and right torsion springs.

(c) Doors shall be commercial and industrial type, as furnished by manufacturer, and shall not be residential type of door.

(5) Fittings, Hanging and Trimming. - The contractor shall set, fit, and hang all doors including combination storm and screen doors. Swing doors shall have 1/16-inch clearance at side and top and 3/16-inch clearance over thresholds at the bottom, and shall be hung and trimmed with hardware as specified. Doors in openings without thresholds shall have 3/8-inch clearance. Screens shall be fitted and made insect tight.

m. Blocking, Strapping and Furring. - Wood blocking, strapping, and furring shall be furnished as indicated or required for proper support or attachment of other items of work.

n. Interior Finish. - (1) Interior Finish. - Interior finish shall be manufactured of wood specified. All interior trim, including base board, chair rail, casings, window stools and aprons shall conform to the details shown. All interior trim to be set against the plaster and wallboard in the buildings shall be run with hollow backs. All joints shall be made in an approved manner to conceal shrinkage and shall be tight. Joints shall be secured with fine finishing nails and with screws where required. All nails shall be set for putty stopping. Wood finish shall be set straight plumb or level, in perfect alignment, and shall be closely fitted. Window and door trim shall be in single lengths. Moldings shall be mitered at exterior corners and coped at interior angles. Hook strips shall be provided for closet shelves. The work shall be installed as detailed and as indicated on the drawings. Bench shall be anchored to wall with two 3" x 3" clip angles on each rear leg.

(2) Walls, Ceilings, etc. - Walls, ceilings and all other areas where indicated shall be covered with gypsum board. Joints shall be reinforced, taped and concealed and all nail heads filled with three coats of joint material. Storage, handling, nailing, erection, corner treatment, taping of joints, nailing and concealing of all nailing

depressions shall be in accordance with manufacturer's instructions. All gypsum wallboard, except in Utility Building Heater Room, shall conform to subparagraph 34-09b(2). Gypsum wallboard for wall and ceiling finish in Heater Room shall be special fire-retardant type gypsum board not less than 5/8-inch thick and bearing Underwriters' Laboratories label for 1-hour rating. Where double layers are indicated, joints of face layer shall not occur on base layer.

(3) Pressed Wood Fiberboard. - Pressed wood fiberboard shall be installed as a wainscot as shown on the drawings using a combination nailing and adhesive method. The installation of pressed wood fiberboard shall be in accordance with manufacturer's recommendations. The board shall be conditioned as follows:

(a) Screen-Back Hardboard. - The contractor shall scrub cold water into the screen side of each panel with a stiff broom or brush until the color of the panel darkens. The panels shall be stacked screen sides together, covered with a tarpaulin or other covering and allowed to stand for 24 hours just prior to use.

(b) Smooth-Back Hardboard. - The contractor shall place a single thickness of newspaper over the entire intended back side of a panel and thoroughly wet the newspaper with cold water. Next, the panels shall be sandwiched in this manner. Finally, the stack shall be covered with a tarpaulin or other covering and allowed to stand for 24 hours just prior to use.

(4) Scuttles. - Scuttles shall be constructed as indicated.

(5) Floors. - Finished wood flooring shall be dressed and matched, laid with close joints on building paper, tightly driven up and blind-nailed with eight-penny cut steel or spiral or screw type flooring nails into each floor joist. Joints shall be alternated, so that there will be at least two boards between them. Flooring shall be machine-sanded, with hand scraping around edges or other surfaces not accessible by machine, and left in perfect condition for finishing. Floors shall be protected until the finish treatment has been applied.

o. Kitchen Cabinets and Counters. - Kitchen cabinets for Operators' Quarters shall conform to the details shown on the drawings, and shall be of stock patterns, accurately and neatly fitted and jointed. All exposed surfaces of cabinets and counters shall be of select grade birch lumber or birch-veneered plywood as indicated. Birch-veneered plywood shall be CS 35, type II, good grade for natural finish, thickness as indicated. Concealed and enclosed plywood shall be interior type, grade B-C, thickness as indicated, conforming to CS 45. Counters shall be provided with one sliding type cutting board and one cutlery drawer. Hardboard where required shall conform to the requirements specified hereinbefore. Counter tops and back splashes shall be covered with laminated plastic sheets conforming to Federal Specification L-P-00508a,

style D, type I, grade HP, class 1, finish A, color as selected by the Contracting Officer. Metal trim shall be stainless steel or chromium plated. All hardware required for the cabinets shall be furnished and installed by the cabinet manufacturer and shall be the manufacturer's standard types as approved by the Contracting Officer.

p. Planter. - Planter in Living Room of Operators' Quarters shall conform to the details shown on the drawings. Birch trim and birch-veneered plywood shall conform to requirements specified above for kitchen cabinets and counters. Concealed plywood shall be exterior type, grade B-C, thickness as specified, conforming to CS 45.

q. Access Panel. - Access panel to bathtub plumbing shall have closure made of 1/2-inch thick, interior type, grade B-C plywood conforming to CS 45. The opening shall be framed to the required size and trimmed. Plywood shall be attached to the trim with suitable wood screws.

34-10. ASPHALT TILE. - a. General. - Asphalt tile shall be installed in the office of the Utility Building. Materials shall be stored at a minimum temperature of 75 degrees F. for at least 24 hours before installation. In the spaces where asphalt tile is being installed, a temperature of at least 75 degrees F. shall be maintained from 48 hours before installation until 48 hours after installation. Adequate ventilation shall be provided to take off moisture and volatile fumes. Unless otherwise specified, materials and methods used shall be in strict accordance with the recommendations of the manufacturer of the asphalt tile. Materials shall be delivered to the project site in the manufacturer's original unopened containers with the manufacturer's brand and name clearly marked thereon. Asphalt tile edging strips shall be provided when indicated.

b. Materials. - (1) Asphalt tile shall conform to Federal Specification SS-T-306b, shall be 9 inches square and 1/8-inch thick, and shall be selected from color group B.

(2) Primer shall be one of the following types, depending on which type cement is used.

(a) Emulsion-type primer consisting of water and emulsion-type cement conforming to Federal Specification SS-A-00138, class 1, mixed to the consistency of heavy paint.

(b) Cut-back-type primer composed of an asphaltic base reduced with a suitable light volatile solvent to a thin liquid weighing approximately 7 pounds per gallon, and made specially for use with asphaltic tile.

(3) Cement shall be one of the following types, unless a specific type is recommended by the manufacturer of the tile used.

(a) Emulsion-type cement conforming to Federal Specification SS-A-00138, class 1.

(b) Cut-back type cement conforming to Federal Specification SS-A-128.

c. Design. - The design of the floor shall be a straight checkerboard using one color with grain reversed. Edging strips shall be installed where indicated on the drawings.

d. Preparation of Subfloor. - Surfaces to receive asphalt tile shall be swept clean and shall be free from moisture, paint, oil, and wax. Concrete floors shall have cracks, rough areas, or other surface defects filled with plastic material.

e. Installation. - (1) Priming coat shall be of the same type as the cement and shall be applied to concrete floor in the following manner:

(a) Emulsion-type primer shall be brushed over the entire surface to be covered with asphalt tile. Primer shall be allowed to become thoroughly dry.

(b) Cut-back-type primer shall be worked well into the surface of the concrete with stiff brushes or a straightedged steel trowel using the minimum quantity that will assure covering the surface completely with a nonabsorptive base. Primer shall be allowed to become thoroughly dry.

(2) Cement shall be either of the emulsion type or cut-back type in accordance with the manufacturer's recommendations, and shall be applied to the floor with a notched steel trowel and allowed to set until the surface is tacky, 30 minutes to 3 hours. The notches in the trowel shall be not over 1/16-inch deep and spaced 3/16-inch on centers. The notches shall be maintained at the specified depth, and renewed with a fine triangular file when reduced by wear.

(3) Tile. - When the cement is sufficiently dry, the asphalt tile shall be installed in accordance with the design layout herein specified. Tile shall be laid in such manner that the entire undersurface will be securely bonded in place. Tiles shall be tightly fitted so that each tile is in contact with the surrounding tiles and joints are in proper alignment. The graining in alternate tiles shall be reversed to give a checkerboard appearance.

f. Cleaning. - The asphalt tile shall be thoroughly cleaned of cement spots, dirt, and other soiling and shall be left in a condition satisfactory for waxing. Spots shall be removed by means of a putty knife and steel wool, or by a cloth moistened with a neutral soap of a type approved by the manufacturer of the asphalt tile. The use of solvents, wet-mopping, and washing are prohibited.

g. Protection. - From the time of cleaning until acceptance by the Contracting Officer, the asphalt tile shall be properly protected by a covering of heavy paper, and by board walks in areas where damage to the floor may occur because of subsequent building operations.

34-11. LATHING AND PLASTERING. - a. General. - Plaster shall be installed in bathroom of Operators' Quarters. This paragraph includes lathing and plastering base for ceramic wall tile. The finish coat of plaster shall not be applied on walls until after the wainscots have been installed. Plaster shall be applied on upper surfaces of walls after the wainscots have been installed. Except as otherwise indicated or specified, plaster shall be applied as follows:

(1) Gypsum Plaster. - Gypsum plaster shall be applied over metal or gypsum lath for ceiling and over metal lath only for walls.

(2) Keene's Cement Plaster Finish. - Keene's cement plaster finish shall be applied only over gypsum-plaster base.

(3) Portland Cement Plaster (Ceramic tile base). - Portland cement plaster shall be applied over metal lath. Portland cement plaster shall not be applied to gypsum lath.

b. Materials. - (1) Gypsum Lath. - Gypsum lath shall conform to Federal Specification SS-L-30, 3/8-inch thick sheets.

(2) Gypsum Plaster. - Gypsum plaster shall conform to Federal Specification SS-P-402; type N, fibered for gypsum neat plaster and type G for calcined gypsum, or shall be the equivalent type conforming to ASTM C 28.

(3) Hydrated Lime. - Hydrated lime shall conform to Federal Specification SS-L-351, type F, with the further requirement that the total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) shall not exceed 8 percent by weight, calculated on the as-received basis. Where it is used for base coats, hydrated lime shall be fibered and mill-mixed at the mill.

(4) Keene's Cement. - Keene's cement shall conform to Federal Specification SS-C-161, type II.

(5) Lightweight Plaster Aggregates. - Lightweight plaster aggregates shall conform to ASTM Standard C 35.

(6) Lime Putty. - Lime putty shall be made from hydrated lime, except that quicklime may be used when adequate time and facilities are available for aging. Suitable precautions shall be taken to protect the putty from exposure to the sun and to prevent excessive evaporation and wind-borne pollution. Lime putty prepared from quicklime shall be allowed to cool completely before using. Lime putty prepared from hydrated lime shall be machine-mixed with water to form a putty and shall be allowed to stand for at least 15 minutes before using.

(7) Metal Lath. - Metal lath shall conform to Federal Specification QQ-B-101c. Expanded metal lath shall be cut from copper-bearing steel sheets, coated with rust-inhibiting paint after cutting, or shall be cut from zinc-coated steel sheets. Wire lath shall be woven from copper-bearing cold-drawn wire, electrically welded and zinc coated, shall have not less than 2-1/2-meshes per inch. Types and weights of lath shall be as specified hereinafter in Paragraph, INSTALLATIONS.

(8) Nails. - (a) Nails for Metal Lath. - Nails for attaching diamond-mesh lath and small-mesh wire lath to horizontal wood supports shall be 1-1/2-inch 11-gage barbed roofing nails with 7/16-inch-diameter heads. Nails for attaching diamond-mesh lath and small-mesh wire lath to vertical wood supports shall be fourpenny common nails or 1-inch 14-gage roofing nails with 7/16-inch-diameter heads driven to a penetration of at least 3/4-inch, or 1-inch wire staples driven home. Nails or staples for attaching 3/8-inch rib lath to horizontal or vertical wood supports shall be 3/8-inch longer than respectively required for the other bases specified above, unless attachment is through the rib, in which case equivalent penetration into the supports shall be provided. Common nails shall be bent over to engage at least 3 strands of flat lath or the rib of 3/8-inch rib lath. Nails for attaching paperbacked wire lath to horizontal or vertical wood supports shall be 12-gage blued U-shaped-head nails driven to a penetration of not less than 3/4-inch and encircling a reinforcing wire of the lath.

(b) Nails for Attaching Gypsum Lath. - Nails for attaching gypsum lath shall conform to Federal Specification FF-N-105, 13-gage blued plasterboard nails with 3/8-inch-or 19/64-inch-diameter flatheads, 1-1/8-inches long.

(9) Plaster-Base Accessories. - (a) Cornerite. - Cornerite shall be strips of zinc-coated or painted expanded metal 6-inches wide, bent to form two 3-inch wings, and weighing not less than 2.5 pounds per square yard.

(b) Strip Lath. - Strip lath shall be painted expanded metal not less than 3 inches wide, and weighing at least 2.5 pounds per square yard.

(10) Portland Cement. - Portland cement shall conform to Federal Specification SS-C-192d, type I, or to SS-C-208b. Only one brand shall be used in the work.

(11) Sand. - (a) Sand for Portland Cement Plaster. - Sand for portlant cement plaster shall conform to ASTM Standard C 114.

(b) Sand for Gypsum Plaster. - Sand for gypsum plaster shall conform to ASTM Standard C 35.

(12) Water. - Water shall be clean and free from oils, acids, alkalies, and organic or other injurious matter.

c. Delivery and Storage. - Manufactured materials shall be delivered in the original packages, containers, and bundles bearing the name of the manufacturer and the brand. Plaster, cement, lime, lath, and accessories shall be stored off the ground under watertight cover, and away from sweating walls and other damp surfaces, until ready for use. Damaged or deteriorated materials shall be removed from the premises.

d. Installations. - (1) Cornerites. - Where plaster finish is required, cornerites shall be installed in the following locations.

(a) At Interior Angles.

Where the abutting surfaces are metal lath, except where metal lath is continued around the corner not less than 3-inches.

(b) At the Junction Between Ceiling and Wall Surfaces. - At the junction between ceiling and wall surfaces, except where the metal lath is turned down at least 3-inches on the walls. Cornerite shall be tied securely to abutting lathed surfaces at the outer edges only. Cornerite shall be attached to gypsum lath at intervals not over 6-inches on centers, by fastenings staggered on the two edges, but nails shall not extend through the lath into the supports.

(2) Gypsum Lath. - Gypsum lath shall be applied with the long dimension across the supports. Boards shall be abutted snugly, and end joints shall be made over supports. End joints shall be staggered in alternate courses, in between. Gypsum lath shall be nailed at each end and at each intermediate bearing, using 4 nails spaced not over 5-inches on centers for a 16-inch board. Nailed edges shall have a full firm bearing and the boards closely fitted at internal angles, corners, and around electric outlets and similar openings. Nails shall be not less than 3/8-inch from ends and edges of lath, and shall be securely driven with the face of the nailhead flush with the face of the lath. Internal angles shall be fitted with cornerite attached by clips, wiring, or nailing along the outstanding edges of the lath. When approved, a spring clip or floating wall type of attachment may be used in place of the nailing specified above. Corners at openings shall be reinforced with strip lath diagonally across the corners, securely nailed through the gypsum lath into adjacent stud.

(3) Metal Lath. - Metal lath shall be applied in such manner as to form true surfaces, straight or in fair curves, without sags or buckles, and with the long dimension of the lath at right angles to the direction of the supports. Metal lath shall be applied to walls with the lower sheet lapping over the upper sheet. Metal lath shall be nailed to supports at intervals not exceeding 6 inches. The sidelaps of lath on walls and partitions shall be secured to supports and tied at intervals not exceeding 9 inches between supports. The sidelaps of lath in ceilings shall be secured to supports and tied at intervals not exceeding 6 inches between supports. The uses of the various types of metal lath shall be as follows:

Metal Lath

Type	Over vertical supports	p.s.y.	Over horizontal supports	p.s.y.	Support spacing
F	Expanded metal	2.5 or 3.4	Expanded metal	3.4	Not over 16 in. on centers
F	Wire	2.5			" " "
FR	Expanded metal	2.75	Expanded metal	2.75	" " "
F3/8R	Expanded metal	3.4	Expanded metal	3.4	" " "

Metal lath shall be lapped at the sides not less than 1/2-inch. Adjoining sheets of small-opening lath shall be lapped at the ends not less than 1-inch, and such laps shall be staggered and, in all cases, occur only over supports. The ends of the sheets shall be at least one support distant from any angle or corner, and the sheet shall be bent into the re-entrant angle or around the corner; otherwise, cornerite shall be used. Lath applied to ceilings shall be bent at the intersection with walls, partitions, and other vertical surfaces to be plastered, and shall be carried down at least 6-inches.

(4) Strip Lath. - Strip lath not less than 3-inches wide shall be installed over joints between dissimilar base materials where the surfaces to be plastered lie in the same plane, and where the base materials cannot be effectively bonded or tied together.

e. Grounds. - Wood grounds shall develop an average plaster thickness of not less than 5/8-inch, measured from the face of metal lath, or not less than 1/2-inch from gypsum plasterboard to the finish plastic surface.

f. Mixing of Plaster. - Except where hand-mixing of small batches is approved, mechanical mixers of an approved type shall be used for the mixing of plaster. Materials shall be accurately measured in a device that will maintain the specified proportions within a plus or minus tolerance not in excess of 5 percent by volume. Frozen, caked, or lumped materials shall not be used. Mechanical mixers, mixing boxes, and tools shall be cleaned after mixing each batch and kept free of plaster from previous mixes. Plaster shall be thoroughly mixed with the proper amount of water until uniform in color and consistency. Re-tempering will not be permitted, and all plaster that has begun to stiffen shall be discarded. This provision does not apply to lime plaster unless portland cement has been added. Plaster for scratch coats over metal lath shall be fibered by the use of fibered gypsum plaster.

g. Proportioning. - (1) Gypsum Plaster. - The proportioning of aggregate to 100 pounds of the gypsum plaster shall not exceed the following.

Gypsum Plaster

Three-coat work over metal with	Gypsum neat plaster, fibered or Gypsum ready-mixed plaster: Sand, cu. ft.	Perlite or vermiculite, cu. ft.	Gypsum wood-fibered plaster: Sand, perlite, or vermiculite, cu. ft.
Scratch coat	2	2	1
Brown coat	3	2	2
Over gypsum lath	2-1/2	2	1

Mill-mixed gypsum-perlite plaster may be applied at the contractor's option in lieu of job-mixed lightweight-aggregate plaster, provided the proportions specified above are used.

Finish Coat

Keene's cement	1 part Keene's cement, 1/4 part dry hydrated lime, 1/10 part fine white sand when approved, by weight.

(2) Portland Cement Plaster For Ceramic Tile Base. - Each coat shall be proportioned as follows:

(a) Scratch coat for foundation coat shall be composed of 1 part portland cement to 3 parts sand, with the addition of 10 percent hydrated lime by volume of the cement used.

(b) Float coat shall be composed of 1 part cement, 1 part of hydrated lime, and 3-1/2 parts sand.

h. Application of Plaster. - When the prevailing outdoor temperature is less than 55 degrees F., a uniform temperature of not less than 55 degrees F. shall be continuously maintained in the buildings for a period of not less than 1 week prior to application of plaster, while the plastering is being done and after the plaster is dry. Heating devices shall be placed as near as practicable to the center of the room, and shall be piped out through an opening in an exterior wall. Properly regulated ventilation shall be provided. Plaster shall not be applied when the surfaces contain frost. Gypsum plaster shall be applied in three coats. Finish coats shall have a reasonably uniform thickness of approximately 1/8-inch, and the minimum thickness at any point shall be 1/16-inch. The thickness of the gypsum plaster, from the face of the plaster base to the finished plaster surface, shall be not less than 5/8-inch over metal lath and not less than 1/2-inch over gypsum lath.

(1) Three-Coat Work. - Gypsum Plaster. - (a) Scratch Coat. - Scratch coat shall be applied with sufficient material and pressure to form a good bond with plaster base and to form full keys on metal lath and shall be not less than 3/16-inch over the face of the metal, then scratched to form a rough surface.

(b) Brown Coat. - Brown coat shall be applied after the scratch coat has set firm and hard, shall be brought out to grounds, straightened to a true surface, and cross-raked, ready to receive the finish coat.

(c) Finish Coat. - In the application of trowel finishes, the use of excessive water shall be avoided.

l. Keene's Cement Finish. - Keene's cement finish shall be applied over a partially dry base coat or over a thoroughly dry base coat which has been evenly wetted by brushing or spraying, shall be scratched in thoroughly, laid on well, doubled back, and filled out to a true, even surface. The thickness shall be from 1/16 to 1/8-inch. The finish shall be allowed to draw a few minutes and then shall be well troweled with water to a smooth finish, free from blemishes and irregularities. Troweling shall continue until the finish sets.

(2) Portland Cement Plaster. - Portland cement plaster shall be two-coat application not less than 3/4-inch thick. Scratch coat shall be not less than 1/4-inch thick. While still plastic, the scratch coat shall be deeply scored or scratched and cross-scratched. The scratch coat shall be protected and kept reasonably moist during the seasoning period. Mortar for scratch and float coats shall be used within 1 hour after mixing. The retempering of partially hardened plaster will not be permitted. The scratch coat shall be applied not more than 48 hours nor less than 24 hours before starting the setting of tile. The float coat shall be brought flush with screeds or temporary guide strips so placed as to give a true and even surface at the proper distance from the finished face of the tile.

i. Sampling. - Where samples taken from plasterwork in place show evidence of oversanding or other deficiencies, the limits of the defective work shall be determined and shall be removed and replaced by the contractor.

j. Patching. - Plaster containing cracks, blisters, pits, checks, or discoloration will not be acceptable. Such plaster shall be removed and replaced with approved plaster conforming to this specification. Patching of defective work will be permitted only when approved and such patching shall match existing work in texture and color.

k. Marble Threshold. - Install marble threshold at bathroom entrance. Marble shall be Georgia Cherokee, Alabama Vein White, Vermont Standard White, or similar approved light colored marble. Surface exposed to foot traffic shall be honed. Threshold shall be bedded solid with portland cement mortar.

34-12. CERAMIC TILE. - a. General. - This paragraph covers ceramic floor and wall tile for the Operators' Quarters bathroom. Containers shall be delivered to the site with labels intact and seals unbroken and shall not be opened until inspected. Work under this section shall not be performed unless a temperature of at least 50 degrees F. can be maintained without interruption for 3 days after completion of the installation.

b. Materials. - Materials shall conform to the respective specifications and other requirements specified below:

(1) Building Paper. - Federal Specification UU-P-147b, type VI or VII, class B.

(2) Calking Compound. - Federal Specification TT-C-598.

(3) Felt, Asphalt-Saturated. - Federal Specification HH-F-191, type I, 15-pound weight.

(4) Hydrated Lime. - Federal Specification SS-L-351, type M or type F, with the further requirement that the total free (unhydrated) calcium oxide (CaO) and magnesium oxide (MgO) in the hydrated product shall not exceed 8 percent by weight, calculated on the as-received basis.

(5) Portland Cement. - Portland cement, including white cement, shall conform to Federal Specification SS-C-192d, type I.

(6) Sand. - Sand shall be clean, washed, sharp, durable, fine aggregate, free from silt, loam, clay, soluble salts, and organic impurities. Sand for setting beds of floors shall be well graded passing a No. 8 sieve, with not more than 5 percent passing a 100-mesh screen. Sand for grout shall be screened to pass a 30-mesh sieve with not more than 5 percent passing a 100-mesh screen.

(7) Tile. - Tile shall conform to the applicable requirements of Simplified Practice Recommendation R 61, standard grade. A "master grade certificate" signed by the manufacturer and the contractor shall be delivered to the Contracting Officer before the tile-setting work is begun. The labels on the tile containers shall be marked to correspond with the marks on the certificate.

(a) Ceramic-Mosaic Floor Tile. - Ceramic-mosaic floor tile shall be either porcelain, natural-clay, or vitreous type, 1/4-inch thick, with plain or cushion edges. Ceramic floor tile shall be laid as a

three-unit random mosaic design having the small unit not over 1- by 1-inch, or a two- or three-rectangular-unit pattern having the large unit not over 2- by 2-inch size. Color of floor tile shall be in accordance with the color schedule or as selected from the manufacturer's stock color samples submitted for approval.

(b) Glazed Wall Tile. - Glazed wall tile shall be nominal 4-1/4-inch squares, not less than 1/4-inch thick, and shall have a nonvitreous body and glazed surface with matte glaze finish. Wall tile shall be cushion edge and shall include all stops, returns, trimmers, caps, and other special shapes required to produce a complete and neatly finished installation. Color of wall tile shall be in accordance with color schedule or as selected from the manufacturer's stock color samples submitted for approval.

(8) Water. - Water shall be clean and free from injurious amounts of oil, acids, soluble salts, and organic impurities.

c. Accessories. - Porcelain-type accessories as specified below shall be provided for bathroom. The color of accessories shall match the color of the wall tile or the trim, or shall be as selected and approved.

(1) Recessed soap holder and grab-bar combination, 6" x 6".

(2) Soap holder, 4-1/2" x 4-1/2".

(3) Toilet paper holder, recessed, 6" x 6".

(4) Tumbler and tooth brush holder, 4-1/2" x 4-1/2".

(5) Towel Bars. - One 18-inches in length and one 24-inches in length, installed where directed.

d. Installation of Floor Tile. - Floor-tile operations occuring in spaces requiring both floor and wall tile shall not start until wall-tile setting has been completed.

(1) Laying Out Work. - Floor shall be laid from the center-lines outward and adjustments shall be made at the walls with a minimum of cut tiles.

(2) Installation of Setting Bed Over Wood Subfloor. -

(a) Waterproof Building Paper or Felt. - Waterproof building paper or felt shall be laid over the wood subfloor and turned up at least 2-inches at vertical intersections. Joints between sheets shall be lapped 2-inches and nailed as required to keep the paper or felt flat.

(b) Reinforcement. - The setting bed shall be reinforced with galvanized wire mesh or expanded metal lath. Reinforcement

shall be flattened and laid over the waterproof paper or felt with uncut edges lapped the width of 1 mesh and cut ends and edges lapped not less than 2-inches. The mesh shall be tied together at laps with galvanized 18-gage iron or soft-steel wire, at intervals of not more than 10-inches along the finished edges and not more than 7-inches along the cut ends and edges of mesh. The mesh shall be secured to the wood subfloor with the minimum number of staples required to hold the mesh flat, driven to within 1/4-inch of the paper or felt.

(c) Setting Bed Mortar. - Setting bed mortar shall be composed of 1 part portland cement and 3 parts sand, to which not more than 5 percent of hydrated lime, by volume of the cement, may be added, mixed with as little water as will produce a workable mass.

(d) Installation of Setting Bed. - Mortar shall be spread over the reinforcing mesh with a screed forcing out all air pockets and providing a level and smooth bed. The average thickness of the setting bed shall be 1-inch but in no case less than 3/4-inch. The area of the bed to be spread in a single operation shall not be greater than can be covered with tile during the same working period.

(3) Laying Ceramic-Mosaic-Tile Floor. - When the setting bed has set sufficiently to be worked over, neat portland cement shall be sprinkled over the surface and the tile laying begun. Straightedges shall be set to the lines established and be reset at suitable intervals to keep the joints parallel over the entire area. The sheets of ceramic-mosaic tile shall be laid to the straightedges, with the joints between sheets the same as the joints between the tiles on the sheets, after which the tile shall be tamped solidly onto the bed, using wood blocks of such size as to insure solid bedding free from depressions. Fractional changes in dimensions without varying the uniformity of joint widths will be permitted. Tile shall be cut with a suitable cutting tool, and rough edges shall be rubbed smooth. Cut-tile misfits shall be replaced with properly cut tile.

(4) Grouting. - When the setting bed has hardened sufficiently, the paper sheets on ceramic-mosaic tile shall be moistened and removed, and the joints completely filled with grout by screeding and brushing the grout mix over the tile until the joints are thoroughly filled. All excess grout shall be removed. Not less than 48 hours shall elapse before ordinary foot traffic is permitted on the floor. Grout shall be mixed as follows: Grout for joints in ceramic-mosaic tile shall be a thick soupy mix of neat portland cement.

e. Installation of Wall Tile. - (1) General. - The application of the scratch coat shall not start until waterproof paper or felt has been laid over the wood subfloor. The waterproof paper or felt shall be protected with boards or additional building paer while the tile setters are at work. Lathing and plastering is specified under Paragraph "Lathing and Plastering".

(2) Setting Wall Tile. - Wall tile shall be thoroughly soaked in clean water before setting, then set by troweling a skim coat of neat portland-cement mortar on the float coat or applying a skim coat to the back of each tile unit and immediately floating the tile into place. Joints shall be straight,level, perpendicular, and of even width not exceeding 1/16-inch. Wainscots shall be built of full courses, and may extend higher, but in no case more than 1-1/2-inches lower than the height specified or indicated. Tile shall be so laid out that cutting of tile occurs at corners and no tile less than half full width is required. Vertical joints shall be continuous and maintained plumb for the entire height of the tile work. Accessories shall be supported and installed as recommended by manufacturer.

(3) Grouting. - Joints in wall tile shall be grouted full with a plastic mix of neat white portland cement immediately after a suitable area of tile has been set. The joints shall be tooled slightly concave and the excess mortar shall be cut off and wiped from the face of tile. Any interstices or depressions in the mortar joints after the grout has been cleaned from the surface shall be roughened at once and filled to the line of the cushion edge before the mortar begins to harden. Tile bases or coves shall be solidly backed with mortar. Joints between wall tile and plumbing or other built-in fixtures shall be made with a light-colored calking compound. Immediately after the grout has had its initial set, tile wall surfaces shall be given a protective coat of a noncorrosive soap or other approved method of protection.

f. Cleaning. - Upon completion, all tile floor and wall surface shall be thoroughly cleaned in such manner as not to affect the glazed surface.

g. Curing and Protection. - Tile shall be damp-cured for a period of not less than 48 hours before foot traffic is permitted over finished floor. After curing, the floor shall be covered with building paper. Cracked, broken, damaged, or otherwise faulty tiles shall be removed and replaced without additional cost to the Government.

34-13. LINOLEUM. - Linoleum shall be installed in the kitchen of the Operators' Quarters, in full-length pieces with a minimum of joints. Remnants and seconds will not be permitted. All wrappings or containers with seals unbroken and with the manufacturer's name and brand clearly marked thereon. Packages shall not be opened until inspected by the Contracting Officer. Linoleum shall be stored at temperature of not less than 70 degress F. for at least 24 hours before installation. The temperature in the space in which the linoleum is to be installed shall be maintained at not less than 70 degrees F. for a period of 24 hours before the installation is started, and also during the installation.

a. Materials. - Materials shall conform to the respective specifications and other requirements specified below.

(1) Felt lining shall be semi-saturated asphalt rag felt weighing not less than one pound per square yard.

(2) Linoleum shall be not less than 0.125 inch thick. Colors shall be as selected from the manufacturer's standard colors and patterns. Linoleum shall conform to Federal Specification LLL-L-367, class C, or to Federal Specification LLL-F-471, type I, class A, marbleized.

(3) Waterproof cement shall conform to Military Specification MIL-C-15200.

b. Preparation of Subfloor. - Surfaces to receive linoleum flooring shall be clean and free from dirt, grease, oil, wax, alkali, moisture, and other deleterious matter. Joints and cracks shall be filled with plastic material recommended by the linoleum manufacturer, and finished flush with the surface. Ridges shall be ground smooth. No linoleum shall be laid until the subfloor is thoroughly dry. Loose boards in wood floors shall be securely nailed. Defective boards shall be replaced. Knotholes and cracks 1/8-inch or more in width in floor boards shall be filled with an approved wood filler. Nailheads shall be flush or set. Ridges or other unevenness of surfaces shall be planed, scraped, sanded or ground smooth, and then sealed with an approved floor sealer before the felt lining is applied.

c. Application of Felt Lining. - Felt shall be provided over wood strip flooring. Felt shall be carefully cut to fit around all vertical surfaces. Joints in felt shall be butted with cross joints staggered. Felt shall be applied to the floor with waterproof cement and shall be rolled into the paste to remove air bubbles and insure complete adhesion, using a linoleum-type roller weighing approximately 150 pounds.

d. Application of Linoleum. - Linoleum shall be laid with joints parallel to the walls of the room, and across the joints of the boards in the wood floor. Linoleum shall be accurately cut to form a tight joint at all vertical surfaces. The paste shall be applied to the floor with a toothed spreader to within approximately 4-inches of the seams. The linoleum shall be thoroughly rolled into the paste from the center out to the edges of the strips to remove all air bubbles and secure complete adhesion. A linoleum-type roller weighing approximately 150 pounds shall be used for rolling. Seams shall be lapped at least 1/2-inch, except that when linoleum with a patter is used, the laps shall be 3/16-inch. The waterproof cement shall than be applied to the bands left under the seams, the linoleum cut through both thicknesses using a straightedge as a guide, and the edges of the linoleum strips bedded and rolled into the adhesive, leaving the joints tight and practically invisible. The linoleum shall be so laid that the bottom surface will be well bonded to the underfloor and the top surface left smooth, clean, and free from imperfections. Unless otherwise indicated, the linoleum shall extend under radiators to base or to the backs of recesses, alcoves, or closets. Holes for pipe shall be neatly cut.

e. Edge Strips. - Edge strips shall be provided at exposed edges of linoleum flooring and where thresholds are not required. The strips shall be solid extruded aluminum alloy, 1/8-inch thick and 3/4-inch wide, butt type and rounded or beveled on the exposed edge. The top surface shall be flush with the linoleum. The strips shall be secured to the floor with aluminum alloy screws spaced at 6-inches on centers. Strips shall be drilled and countersunk for the screws.

f. Cleaning. - The flooring shall be thoroughly cleaned of all paste spots, dirt, and other soiling, and left in a clean, smooth condition for waxing.

g. Protection. - After cleaning, the flooring shall be protected by a covering of heavy building paper. Boardwalks shall be placed over the flooring in all areas where damage to the floor might occur because of subsequent building operations.

34-14. BUILDERS' HARDWARE. - a. General. - Builders' hardware shall be furnished and installed as required by the drawings and specifications. All items of builders' hardware shall be carefully fitted and securely attached. Care shall be exercised not to mar or injure other new work. Upon completion of the work, the contractor shall, in the presence of the Contracting Officer, show that all hardware works in perfect order, shall fit all keys in their respective locks, and upon acceptance of the work, shall tag and deliver all keys to the Contracting Officer. Oilite bearing butts may be furnished in lieu of ball bearing butts at option of contractor.

b. Lock Sets. - Lock sets shall embody locking mechanism herein specified and trim conforming to the design specified. Where the exact types of hardware specified are not adaptable to the finished shape or size of members requiring the hardware, suitable types having as nearly as practicable the same operation and quality as type specified shall be furnished. Locks shall have beveled, rounded or rabbeted faces where required. Solid or wrought bronze knobs shall be installed on the exterior doors of the buildings.

c. Materials. - Materials, unless otherwise specified, shall conform to the applicable requirements of the following Federal Specifications.

FF-H-106a	Hardware, Builders; Locks and Door Trim
FF-H-111a	Hardware, Builders; Shelf and Miscellaneous
FF-H-116c	Hinges, Hardware, Builders
FF-H-121c	Hardware, Builders; Door Closing Devices

Hardware for the various items shall conform to the requirements set forth below:

Double-Hung Windows

2 Sash Balances	Type F1245
1 Fastener	Type 1140
2 Sash Lifts	Type 1212

Aluminum Combination Storm and Screen Doors

See Paragraph 34-08j.

Window Screens (for Double-Hung Windows)

Sash Lift — Type 1212- 2 each screen

Storm Sash (for Double-Hung Windows)

Hangers, Type F1830, galvanized, 2 for each sash.
Fasteners, wing nut type, 2 for each sash.
5-inch friction type, ball-and-socket joint, friction ventilating hook.

Overhead Doors

Hardware as recommended by door manufacturer for type of doors specified. Doors for Utility Building shall be provided with automatic locking device which locks door in closed position, permitting release from interior only. Door for garage shall be provided with a locking device which provides for operations from both sides of door with cylinder lock and key from exterior.

Door Stops

Provide where item of hardware on an opened door might contact wall or other part of building construction. All doors (except metal clad) Type 1322, except Type 1328E in men's toilet and storage and stock room in Utility Building.

Exterior Doors (Utility Building)

3 Butts - 4-1/2 x 4-1/2	Type 2107 x US-10
1 Lock and Lock Set	Type 86 E-5S

Storage Room - Wire Grille Door

3 T Hinges - 6-inch	Type 2209 x US2H
1 Dead Bolt Lock	Type 181K with 4" x 6" steel plate on face of door over lock to prevent tampering- plate cut to accommodate lock cylinder.

Heater Room Door (Interior) Utility Bldg.

3 Butts, type T2135 for Kalemein door and type T2107 for hollow metal door, 4-1/2" x 4-1/2", USP
1 Lockset, type 86B-4
1 Closer, type 3001, Size III

Heater Room Door (Interior) Utility Building

3 Butts - 3-1/2 x 3-1/2	Type 2127 x USP (except door #102)
3 Butts - 4-1/2 x 4-1/2	Type 2127 x USP (Door 102)
1 Lock and Lock Set	Type 85L-4 x emergency key (Toilet Room Door)
	Type 85B-4 (all other 1-3/8" doors)
	Type 86B-4 (1-3/4" door 102)
1 Closer	Type 3001, Size II (Toilet Room Door)

Metal-Clad Door (Fireproof Room)

See Paragraph 34-08d.

1 Padlock, Federal Specification FF-P-101c, type EPA, 1-1/2-inch, with chain.

Toilet and Lavatory Accessories (Interior Toilet - Utility Building)

1 Coat Hook - Type 1172 x US26D
1 Paper Holder, Crane Co., or approval equal, C24-956
1 Soap Dish, Crane Co., or approved equal, C24-940

Awning and Hopper Type Windows

Hardware Standard with manufacture
(See Paragraph relative to windows)

Garage (Swing Door)

3 Butts - 4-1/2 x 4-1/2	Type 2107 USP
1 Lockset, 161A-4	

OPERATORS' QUARTERS

Exterior Door (Front)

3 Butts, 4-1/2 x 4-1/2	Type 2102 US10
1 Lockset, 161A with 5-1/2 x 5-1/2 exterior Escutcheon and with 5" backset	

Exterior Doors (Rear and Basement)

3 Butts, 4-1/2 x 4-1/2	Type 2102 US10
1 Lockset, 161A-4	

Interior Doors (Except as otherwise specified)

2 Butts, 3-1/2 x 3-1/2 Type 2127 USP
1 Lockset, 160N-4

Sliding Closet Doors

Similar and approved equal to Sterling Series 500 with surface pulls and floor guides.

Bathroom Door

2 Butts, 3-1/2 x 3-1/2 Type 2127, US28
1 Lockset, 161L-4

d. Keys. - Each cylinder lock shall be spin tumbler type and shall be provided with three keys. All keys shall be stamped with the change number. Masterkeying shall be as directed. Two master keys shall be furnished.

e. Finish. - Hardware for exterior face of exterior doors, and window sash, including awning and hopper type, shall be dull bronze, US-10. All butts for Utility Building and Garage shall have a priming coat for painting unless otherwise specified. Finish bathroom side shall be US-27 or US-28 as applicable. All interior hardware unless otherwise specified, shall have a US-10 or US-4 finish. Hardware for storm sash shall be galvanized.

34-15. ROOFING. - Thick butt asphalt strip shingles conforming to Federal Specification SS-S-298 or uniform thickness shingles conforming to Federal Specification SS-S-300, type II, shall be applied by workmen skilled at the trade and shall be laid in accordance with the manufacturers' specifications. Shingles shall be 3 tab, and except at ridges, shall be 12-inches by 36-inches. Colors shall be selected from manufacturers' standard color range by the Contracting Officer. Shingles shall be laid with wood shingle starter course, with all courses not more than 5-inches to the weather. Lead flashing shall be installed around the stack and copper flashing around the chimney and elsewhere as shown on the drawings. A layer of asphalt saturated felt shall be nailed on the sheathing prior to application of shingles.

34-16. SHADES. - a. General. - Shades shall be installed on all windows in Operators' Quarters except awning, awning combination, and bathroom windows, and on all windows of the office of the Utility Building.

b. Materials. - Materials shall conform to the following Federal Specifications.

DDD-S-251b for "Shades, Windows; Rollers, Slats Cords, and Accessories".

CCC-C-521b for "Cloth; Window Shade", type II or III. Brackets may be malleable iron, stamped steel, or brass, with a brass, copper, nickel, or chromium finish.

c. Installation. - Shades shall be installed in accordance with the manufacturer's instructions. Brackets shall be accurately located and solidly fastened in place, care being taken not to mar or damage existing work. The contractor shall operate all shades in the presence of the Contracting Officer before final acceptance.

34-17. PAYMENT. - a. Payment for the work specified herein except as otherwise specified in subparagraph b. will be made at the applicable lump sum contract prices for Item 97, "Operators' Quarters", Item 98, "Garage" and Item 96, "Utility Building", and will include all costs for earth and rock excavation for foundations after rough grading has been accomplished, backfilling, fill, masonry, and concrete including platforms and aprons, and all utilities to a line 5 feet outside the building lines, and all concrete walks, all as shown on the drawings and as specified herein.

b. Other items of work in connection with the Utility Building, Garage, and Operators Quarters for which separate payment is provided elsewhere in the specifications are designated below.

Topsoiling and Seeding	Exterior Electrical Work	Pavements
Preparation of Site	Water Supply System	Concrete Curbs
Rough Grading	Sanitary Sewerage System	Surface Drainage System

c. Rock Excavation. - The quantity of rock excavation to be paid for will be the number of cubic yards of actual total volume of boulders greater than 1 cubic yard in size removed during the excavation operations and the actual volume of other rock material removed by authorized excavation as defined in Section 3 of these specifications. Rock excavation shall be made in accordance with the applicable provisions stated in Section 3 of these specifications. Payment for rock excavation will be made at the contract unit price for Item No. 6 "Rock Excavation General" for the specific site of the work and will include payment for all work in connection therewith.

SECTION 35

PLUMBING, GENERAL-PURPOSE
INDEX

Paragraph No.	Paragraph Title	Page No.
35-01	Scope	35-1
35-02	Applicable Specifications	35-1
	a. Federal Specifications	35-1
	b. American Society of Mechanical Engineers Publication	35-2
	c. Hydraulic Institute Publication	35-2
35-03	General	35-2
	a. Utilities	35-2
	b. Cross Connections and Interconnections	35-2
	c. Specifications	35-2
	d. Connections to Equipment and Fixtures Specified Elsewhere	35-3
	e. Drawings	35-3
	f. Cutting and Repairing	35-3
	g. Protection to Fixtures, Materials and Equipment	35-3
35-04	Approval of Materials, Fixtures, and Equipment	35-4
35-05	Excavating, Trenching and Backfilling	35-4
35-06	Materials and Equipment	35-4
	a. Calking Lead	35-4
	b. Fittings	35-4
	c. Pipe and Tubing	35-4
	d. Plumbing Fixtures and Drains	35-4
	e. Plumbing-Fixture-Setting Compound	35-4
	f. Plumbing-Fixture-Setting Gaskets	35-4
	g. Sheet Lead	35-5
	h. Twisted-Jute Packing	35-5
	i. Valves	35-5
35-07	Soil, Waste, Drain and Vent Piping	35-5
	a. Installation	35-6
	b. Joints	35-6
35-08	Cleanout Plugs and Test Tees	35-6

Paragraph No.	Paragraph Title	Page No.
35-09	Flashings	35-6
35-10	Traps	35-6
35-11	Drains	35-7
	a. Floor Drains	35-7
	b. Roof Drains	35-7
35-12	Water Pipe, Fittings, and Connections	35-7
	a. Copper Tubings and Fittings	35-7
	b. Installation	35-8
	c. Joints	35-8
	d. Sterilization	35-8
35-13	Valves	35-9
35-14	Unions	35-9
35-15	Hose and Lawn Faucets	35-9
35-16	Insulation	35-9
35-17	Pipe Sleeves, Hangers, and Fixture Supports	35-10
	a. Pipe Sleeves	35-10
	b. Pipe Hangers, Inserts, and Supports	35-10
	c. Fixture and Equipment Supports and Fastenings	35-11
35-18	Floor, Wall, and Ceiling Plates	35-12
35-19	Electrical Work	35-12
35-20	Painting	35-12
35-21	Electrical Water Heater	35-12
35-22	Types of Fixtures and Fixture Trimmings	35-12
	a. General Requirements	35-12
	b. Cross Connections	35-13
	c. Fixture Connections	35-13
	d. Flush Valves	35-13
	e. Fixtures	35-13

Paragraph No.	Paragraph Title	Page No.
35-23	Hydropneumatic Tanks	35-14
	a. Sight Glass Connections	35-14
	b. Pump Controller Connections	35-14
	c. Air Volume Control	35-14
	d. Pressure Gage	35-14
	e. Pressure Relief Valve	35-14
	f. Air Compressor Unit	35-15
	g. Pressure Switch	35-15
	h. Combination Pump and Air Control	35-15
35-24	Potable Water Storage Tank	35-15
35-25	Decontamination Water Supply	35-15
	a. General	35-16
	b. Suction Pipe	35-16
35-26	Inspection and Tests	35-16
35-27	Guaranty	35-17
35-28	Payment	35-17

SECTION 35

PLUMBING, GENERAL-PURPOSE

35-01. SCOPE. - This section covers plumbing, complete.

35-02. APPLICABLE PUBLICATIONS. - The following specifications and standards of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification:

a. Federal Specifications. -

O-C-114a	Calcium Hypochlorite, Technical and Chlorinated Lime, Technical.
BB-C-120	Chlorine.
CC-M-636a & Am-2	Motors; Fractional Horsepower, (Alternating Current).
HH-C-536a	Compound; Plumbing-Fixture-Setting.
HH-G-116	Gaskets; Plumbing- Fixture-Setting.
HH-I-552	Insulation Pipe Covering, Thermal, and Insulation Blanket, Thermal, Pipe Covering.
HH-P-117	Packing; Jute, Twisted.
QQ-L-156 & Am-1	Lead; Calking.
QQ-L-201a	Lead, Sheet.
QQ-S-775a & Am-1	Steel, Sheets, Carbon, Zinc-Coated.
SS-R-451	Roof-Coating Asphalt, Brushing-Consistency.
WW-H-171b	Hangers and Supports, Pipe (Docks)
W-H-196b	Heaters, Electric; Water, Storage, Noncorrosive.
WW-N-351a & Am-1	Nipples, Pipe, Threaded.
WW-P-401 & Am-3	Pipe and Pipe-Fittings; Soil, Cast-Iron.
WW-P-406b	Pipe, Steel (Seamless and Welded (for Ordinary Use)).
WW-P-460a	Pipe-Fittings; Bronze, (screwed) 125 and 250 Pound.
WW-P-491a & Am-1	Pipe-Fittings; Cast-Iron, Drainage
WW-P-501c & Am-1	Pipe-Fittings; Cast-Iron, Screwed, 125- and 250 Pound.
WW-P-521d & Am-1	Pipe-Fittings; Malleable-Iron, Wrought Iron and Steel (Screwed) 150-Pound.
WW-P-541b & Int. Am-3	Plumbing-Fixtures, Land Use.

WW-T-799a & Am-1	Tubing; Copper, Seamless (For Use with Solder-Joint or Flared-Tube Fittings).
WW-U-516	Unions; Brass or Bronze, 250-Pound.
WW-V-0051b (GSA-FSS)	Valves, Bronze; Angle, Check and Globe, 125-and 150-Pound Screwed and Flanged (for Land Use).
WW-V-54 & Am-2	Valves, Bronze, Gate; 125- and 150-Pound, Screwed and Flanged (for Land Use).
GGG-P-351a	Pipe-Threads; Taper (American National).

b. American Society of Mechanical Engineers Publication. -

Boiler and Pressure Vessel Code Section VIII Unfired Pressure Vessels.

c. Hydraulic Institute Publication. -

Standards of Hydraulic Institute.

35-03. GENERAL. - The general arrangement of the plumbing shall be as indicated on the drawings. Detailed drawings of the proposed departures due to actual field conditions or other causes shall be submitted to the Contracting Officer for approval. Equipment, materials, and fixtures required for use in conjunction with the items to be furnished by the Government, as listed in the SPECIAL CONDITIONS, shall be furnished and installed by the contractor. The contractor shall carefully examine the drawings and shall be responsible for the proper fitting of materials and equipment in each building as indicated, without substantial alteration.

a. Utilities. - Water and drainage piping shall be extended to points 5 feet outside the building where the pipes shall be capped or plugged for extension under other sections of the specifications, except for the fallout shelter decontamination water supply pump suction pipe and tank vent pipe which shall be extended up to the 500 gallon water tank. Utilities shall be installed below frost line. If trenches are closed or pipes are otherwise covered before being connected to street mains, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means.

b. Cross Connections and Interconnections. - No plumbing fixture, device, or piping shall be installed that will provide a cross connection or interconnection between a distributing supply for drinking or domestic purposes and a polluted supply such as a drainage system or a soil or waste pipe in such manner as to make possible the backflow of sewage, polluted water, or waste into the water-supply system.

c. Specifications. - Required materials not covered by the detailed specification shall meet the requirements of the applicable specifications listed hereinbefore, and shall be of the required class, grade, and type. Shop tests of pipe, valves, and fittings, required by Federal Specifications to be conducted in the presence of a Government inspector, are waived.

35-05. EXCAVATING, TRENCHING, AND BACKFILLING. - Excavating, trenching, and backfilling shall conform to Paragraph 34-04 of these specifications.

35-06. MATERIALS AND EQUIPMENT. - The following materials and equipment shall conform to the respective specifications and other requirements specified below:

a. Calking Lead. - Federal Specification QQ-L-156, Type I.

b. Fittings. - (1) Cast-Iron Soil Pipe and Fittings. - Federal Specification WW-P-401.

(2) Cast-Iron Threaded-Fittings. - Federal Specification WW-P-501, Class A or B.

(3) Drainage Fittings. - Federal Specification WW-P-491.

(4) Fittings for Copper Tubing. - Cast-or wrought-bronze or wrought-copper, soldered-joint or flared-type, as hereinafter specified, completely fabricated at the factory. Bronze fittings shall contain not less than 85 percent copper and shall conform to the applicable requirements of Federal Specification WW-P-460. Fittings on Type L tubing shall be of cast or wrought bronze or of wrought copper and shall be of the soldered-joint type. Fittings on type K tubing shall be of cast bronze and shall be of the flared-joint type.

(5) Malleable-Iron Fittings. - Federal Specification WW-P-521, type II.

(6) Nipples. - Federal Specification WW-N-351, same material as pipe system where used.

(7) Unions. - Federal Specification WW-U-516.

c. Pipe and Tubing. - (1) Cast-Iron Soil Pipe. - Federal Specification WW-P-401.

(2) Copper Tubing. - Federal Specification WW-T-799, type K or L, as hereinafter specified.

(3) Steel Pipe. - Federal Specification WW-P-406, Class 2.

d. Plumbing Fixtures and Drains. - Federal Specification WW-P-541.

e. Plumbing-Fixture-Setting Compound. - Federal Specification HH-C-536.

f. Plumbing-Fixture-Setting Gaskets. - Federal Specification HH-G-116, type best suited for the work.

d. Connections to Equipment and Fixtures Specified Elsewhere. - The contractor shall provide all necessary material and labor to connect to the plumbing system all fixtures and equipment having plumbing connections, and which are specified in other sections of these specifications. Drainage connections shall be trapped. The service line to each item of equipment shall be equipped with a cutoff valve to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures.

e. Drawings. - Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. The contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions, at no additional cost to the Government.

f. Cutting and Repairing. - The work shall be carefully laid out in advance, and any excess cutting of construction will not be permitted. Damage to buildings, piping, wiring, or equipment as a result of cutting for installation shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Government.

g. Protection to Fixtures, Materials, and Equipment. - Pipe openings shall be closed with caps or plugs during installation. Fixtures and equipment shall be tightly covered and protected against dirt, water, and chemical or mechanical injury. Upon completion of all work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted and operated.

35-04. APPROVAL OF MATERIALS, FIXTURES, AND EQUIPMENT. - As soon as practicable and within 30 days after award of contract and before any materials, fixtures, or equipment are purchased, the contractor shall submit for approval by the Contracting Officer, a complete schedule in six copies of materials, fixtures, and equipment to be incorporated in the work, together with the names and addresses of the manufacturers and their catalog item numbers and trade names. No consideration will be given to partial lists submitted from time to time. Approval of the materials will be based on manufacturer's published ratings. Approval of materials, fixtures, and equipment under this provision shall not be construed as authorizing any deviations from the specifications, unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided the contractor clearly states such differences and provided all essential requirements of the specifications are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

g. Sheet Lead. - Federal Specification QQ-L-201.

h. Twisted-Jute Packing. - Federal Specification HH-P-117, type II, tarred.

i. Valves. - (1) Angle, Check and Globe Valves. - Federal Specification WW-V-51, class A or B; type as suitable for the application. Soldered-joint-type valves shall be designated for a water working pressure of 150 pounds per square inch.

(2) Gate Valves. - Federal Specification WW-V-54, type I, II, or III, Class A, and where used in connection with copper tubing, modified therefor.

35-07. SOIL, WASTE, DRAIN, AND VENT PIPING. - All underground and 4" and larger above ground soil, waste, and drain pipe and fittings shall be coated or uncoated extra heavy bell-and-spigot cast-iron. Soil, waste, drain, and vent pipe 3" and smaller above ground shall be galvanized steel or bell-and-spigot cast-iron pipe. Fittings for piping above ground shall be drainage pattern for all threaded drain and waste piping, and cast-iron soil fittings for bell-and-spigot pipe. Fittings on all dry vents shall be malleable-iron or cast-iron.

a. Installation. - (1) Drainage Pipes and Vent Piping. - Horizontal soil and waste pipes shall be given a grade of 1/4 inch per foot where possible, but in no case less than 1/8 inch per foot. All main vertical soil and waste stacks shall be extended full size to the roof line and above as vents, except where otherwise specifically indicated. Where practicable, two or more vent pipes shall be connected and extended as one pipe through the roof. Vent pipes in roof spaces shall be run as close as possible to underside of the roof without forming traps in pipes, using fittings as required. Vertical vent pipes may be connected into one main vent riser above vented fixtures. Where a circuit vent pipe from any fixture or line of fixtures is connected to a vent line serving other fixtures, the connection shall be at least 4 feet above the floor on which the fixtures are located, to prevent the use of any vent line as a waste. The cast-iron bell-and-spigot pipe inside of buildings shall be extended 6 inches above the lowest floor where the floor is supported on the ground, and 6 inches above the ground where the lowest floor is self-supporting.

(2) Fittings. - Changes in pipe size on soil, waste, and drain lines shall be made with reducing fittings or recessed reducers. All changes in direction shall be made by the appropriate use of 45-degree wyes, long- or short-sweep 1/4 bends, 1/6, 1/8 or 1/16 bends, or by a combination of these or equivalent fittings. Single and double sanitary tees and quarter bends may be used in drainage lines only where the direction of flow is from horizontal to vertical. Short sweeps not less than 3 inches in diameter may be used where the change in direction of flow is either from

horizontal to vertical or from vertical to horizontal and may be used for making necessary offsets between the ceiling and the next floor above.

(3) Union Connections. - Slip joints will be permitted only in trap seals or on the inlet side of the traps. Tucker or hub drainage fittings shall be used for making union connections wherever practicable. The use of long screws and bushings is prohibited.

b. Joints. - (1) Cast-Iron Pipe. - Joints in bell-and-spigot cast-iron soil, waste, and vent pipes, or between cast-iron soil, waste, and vent pipes and threaded pipe or calking ferrules, shall be firmly packed with oakum or hemp and calked with lead at least 1 inch deep.

(2) Steel Pipe. - Threaded joints shall have American National taperscrew threads conforming to Federal Specification GGG-P-351, with graphite and oil compound applied to the male thread. Connections between steel pipe and soil pipe shall be similar to joint in cast-iron pipe, and the steel pipe shall have a ring or half coupling screwed on to form a spigot end.

35-08. CLEANOUT PLUGS AND TEST TEES. - Cleanouts shall be the same size as the pipe except that cleanout plugs larger than 4 inches will not be required. Cleanouts installed in connection with cast-iron hub-and-spigot pipe shall consist of a long-sweep 1/4 bend or one or two 1/8 bends extended to an easily accessible place, or where indicated on the drawings. An extra-heavy cast-brass ferrule with countersunk trap screw cover shall be calked into the hub of the fitting and shall be flush with the floor. Where cleanouts in connection with threaded pipe are indicated and are accessible, they shall be cast-iron drainage T-pattern 90-degree branch fittings with extra-heavy brass screw plugs of the same size as the pipe up to and including 4 inches. Test tees with cast-iron cleanout plugs shall be installed at the foot of all soil, waste, and drain stacks and on each building drain outside the building.

35-09. FLASHINGS. - Vent pipes and roof drains shall be flashed and made watertight at the roof with not lighter than 4-pound sheet lead. Flashings for vent pipes shall be extended up the vent pipes a minimum of 6 inches where threaded standard cast-iron or malleable-iron recess roof couplings shall be installed to form counterflashing or rain guards for pipe. Flashings in connection with cast-iron pipe vents shall be turned down into the pipes or hubs. Flashing shields shall extend not less than 8 inches from the vent pipes and roof drains in all directions.

35-10. TRAPS. - Each fixture and piece of equipment requiring connections to the drainage system , except grease interceptor, shall be equipped with a trap. Traps are specified to be supplied with the fixtures, except traps for grease interceptors. Each trap shall be placed as near to the fixture as possible, and no fixture shall be double-trapped. Traps installed on bell-and-spigot pipe shall be cast-iron. Traps installed on steel pipe shall be recess drainage pattern.

35-11. DRAINS. - Drains shall be made of high-grade, strong, tough, and even-grained metals. Castings shall be free from blowholes, porosity, hard spots, excessive shrinkage, cracks, or other injurious defects, shall be smooth and well cleaned both inside and outside, and shall have all fins and roughness removed. Castings shall not be repaired, plugged, brazed, or burned-in. The wall thickness of iron castings shall be not less than 1/4 inch. Chromium plating shall conform to Federal Specification WW-P-541. The size of the drains shall be determined by the branch sizes indicated on drawings.

a. Floor Drains. - Floor drains shall conform to Federal Specification WW-P-541, type 216.

b. Roof Drains, Flashings, and Expansion Joints. - Roof drains shall be heavy-pattern cast-iron, beehive, or dome-shaped, with an integral flange and a satisfactory device for clamping or otherwise securing the roof covering so as to make a watertight connection. A 4-pound sheetlead flashing 2 feet square extending into the roofing shall be provided as an integral part of the roofing and shall be securely clamped or soldered to body of drain so as to make a watertight, airtight, durable connection. For gravel or slag roofing the drain shall be provided with a suitable gravel stop. Openings in the strainer shall have a combined area equal to twice the area of the drain outlet. The outlet shall be equipped with necessary parts to make proper connection to threaded pipe of same size as downspout. Roof drains shall be of a pattern having an internal expansion joint of proper size to receive the leader pipe. The expansion joint shall be a heavy cast-brass or copper-sleeve type constructed so as to form a watertight flexible joint. The metal of the sleeve shall have a thickness of not less than 0.134 inch (No. 10 stubs gage). Gaskets and packing shall be of asbestos fiber, soft lead, or other suitable and durable material and shall not be located in the flow line of the drainage. Means of adjustment shall be provided for tightening or replacing the gaskets or packing without disturbing leader-pipe connection to the roof drain. The minimum dimensions of the drain shall be as follows:

Size of leader pipe (inches)	4
Diameter of Flange (inches)	8

35-12. WATER PIPE, FITTINGS, AND CONNECTIONS. - a. Copper Tubing and Fitting. - Copper tubing and fitting shall be used for hot and cold water inside of buildings. Tubing above ground shall be type L hard-drawn or type B. Underground tubing shall be type K annealed. Fittings shall be cast-brass or wrought-copper usuitable for sweat connections for use with hard-drawn tubing, and flared-pattern for annealed tubing.

b. Installation. - A gate valve and drain shall be installed on the service line inside the building. Service piping shall be installed below the frost line. The piping shall be extended to all fixtures, outlets, and equipment from the gate valve. The cold-water system shall be installed with a fall toward the shutoff valve. Plugged or capped fittings shall be provided for draining low points of the piping system except where valved outlets are shown on drawings. Bends formed with hydraulic operated pipe benders are acceptable.

(1) Mains, branches, and runouts. - Piping shall be installed as indicated on the drawings. Pipe shall be cut accurately to measurements established at the building by the contractor and shall be worked into place without springing or forcing. Care shall be taken not to weaken the structural portions of the building. Piping above ground shall be run parallel with the lines of the building unless otherwise shown or noted on the drawings. Branch pipe from service lines may be taken off top of main, bottom of main, or side of main using such cross-over fittings as may be required by structural or installation conditions. Service pipe, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering and other work and not less than 1/2 inch between finished covering on the different services. No water piping shall be buried in floors unless specifically indicated on drawings or approved. Changes in pipe sizes shall be made with reducing fittings. The use of long screws and bushings will not be permitted.

(2) Pipe drains indicated on the drawings shall consist of 1/2-inch globe valves with renewable disks and 3/4-inch hose nipples. Additional drains shall be installed at low points on the hot-water piping, and all piping shall grade down to the drains.

(3) Expansion and Contraction of Piping. - Allowance shall be made throughout for expansion and contraction. Horizontal runs over 50 feet in length shall be anchored to the wall or to the supporting construction about midway on the run to force expansion, evenly divided toward the ends.

(4) Air chambers shall be provided on all supplies both hot and cold, near each faucet, control valve, or flush valve, except lawn faucets and hose bibbs. Where not definitely shown on drawings the air chambers shall consist of a 12-inch length of pipe of same diameter as branch supply, with cap.

c. Joints. - (1) Threaded Pipe. - After cutting and before threading, pipe shall be reamed and shall have burs removed. Screw joints shall be made with graphite or inert filler and oil or with an approved graphite compound applied to male threads only. Calking of threaded joints to stop or prevent leaks will not be permitted. Unions shall be provided where required for disconnection of exposed piping.

(2) Flared and Sweated Tubing. - Tubing shall be cut square, and burs shall be removed. Both inside of fittings and outside of tubing shall be well cleaned with steel wool before sweating. Care shall be taken to prevent annealing of fittings and hard-drawn tubing when making connections. Installation shall be made by competent workmen in accordance with manufacturer's recommendations. Mitering of joints for elbows and notching of straight runs of pipe for tees will not be permitted. Joints for soldered fittings shall be made with a non-corrosive paste flux and solid string or wire solder composed of 40 percent tin and 60 percent lead. Cored solder will not be permitted. Joints for flared-type fittings shall be of the compression pattern.

d. Sterilization. - The entire water distribution system shall be thoroughly sterilized with a solution containing not less than 50 parts per million of available chlorine. The chlorinating material shall be either liquid chlorine conforming to Federal Specification BB-C-120 or calcium hypochlorite or chlorinated lime conforming to Federal Specification O-C-114, and shall be introduced into the system in a manner approved by the Contracting Officer. The sterilizing solution shall be allowed to remain in the system for a period of 8 hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 part per million, unless otherwise directed.

35-13. VALVES. - Valves shall be provided on all supplies to fixtures as specified under TYPES OF FIXTURES AND FIXTURE TRIMMINGS. Valves indicated on drawings in connection with runouts, risers, branches, and mains shall be in accordance with the specification. No valve shall be installed on any line with its stem below the horizontal. All valves shall be gate valves unless otherwise specified or noted on drawings. Valves shall be all brass with sweat-type connections for tubing and shall have wrought bodies.

35-14. UNIONS. - Unions on copper tubing shall be brass, composition B, conforming to Federal Specification WW-U-516. Unions shall not be concealed in walls, ceilings, or partitions.

35-15. HOSE AND LAWN FAUCETS. - Hose faucets inside buildings shall be brass with 1/2-inch male inlet threads, hexagon shoulder, and 3/4-inch hose connection, type 65. Lawn faucets shall be type 207, with 1/2-inch pipe thread inlet and 3/4-inch hose connection outlet.

35-16. INSULATION. - After tests have been completed and surfaces cleaned, insulation shall be installed on all cold water piping except on chromium plated piping. Insulation shall conform to Federal Specification HH-I-552, Type I, Class A, except that insulation shall have a vapor barrier.

35-17. PIPE SLEEVES, HANGERS, AND FIXTURE SUPPORTS. - Pipe sleeves, hangers, and fixture supports shall be furnished and set, and the contractor shall be responsible for their proper and permanent location. Pipe will not be permitted to pass through footings, beams, or ribs unless noted on the drawings.

a. Pipe Sleeves. - Pipe sleeves shall be of cast iron, wrought iron, or steel, properly secured in place, with approximately 1/4-inch space between pipe and enclosing sleeve. Pipe sleeves shall be provided for all pipe passing through walls and floors below finished grade. Sleeves of No. 26 U.S.S. gage galvanized iron of fiber with wall thickness not less than 1/4-inch, or of other suitable approved material, shall be installed with approximately 1/4-inch space all around for all pipes passing through partitions above ground. Where pipes pass through footings, cast-iron pipe sleeves shall be provided not less than 4 inches larger in diameter than pipes for which the sleeves are installed; where pipe covering is used, the sleeves shall be of sufficient size to permit installation of the covering with the usual clearance. Sleeves and chases for piping, inserts for hangers, and similar installations shall be provided in all construction as specified herein. Cutting of construction shall be done only with the permission of the Contracting Officer, and construction shall be repaired to match the original condition by mechanics of the trade which originally executed the work. Under this section the contractor shall do no cutting of woodwork, brickwork, cement work, concrete work, or other materials in the building. Locations and sizes of chases and openings necessary for the proper installation of the work shall be determined in advance and provided during the erection of the work. Sleeves of wrought-iron or steel pipe shall be provided where pipes pass through concrete beams or concrete fireproofing. Sleeves passing through floors shall extend not less than 1-inch and not more than 2 inches above finished floors.

b. Pipe Hangers, Inserts, and Supports. - Hangers shall conform to Federal Specification WW-H-171. Inserts shall permit adjustment of the bolt in one horizontal direction and shall be installed before the concrete is poured. The inserts shall be cast iron, malleable iron, or prefabricated steel, and shall be of a type to receive a machine bolt head or nut after installation. Hangers and supports shall be installed at dimensions not to exceed the maximum limits, and at intervals to keep the pipe alinement and to carry the weight of the pipe and contents.

(1) Horizontal Piping. - Hangers and supports shall be installed as specified hereinafter, and at locations not more than 3 feet from the end of each runout. A hanger shall be installed not over 1 foot from each change in direction of piping. Hangers and turnbuckles shall be types 3, 15, and 17. Type 18 hanger with adjustable swivel nut may be employed to support pipes from toilet rooms to main stacks when space does not permit the use of turnbuckles. Brackets for support of piping at walls shall conform to type 22. In lieu of separate hangers,

the contractor may submit for approval by the Contracting Officer a detail drawing of trapeze hangers with turnbuckles on rods and solid or split-ring clamp for each pipe which he proposes to furnish. Rings shall have a diameter large enough to include the covering for chilled-water piping, and protective saddle type 28 shall be installed with each hanger.

(a) Cast-iron soil pipe shall be supported at not more than 5-foot intervals, and support shall be located near each hub.

(b) Threaded pipe shall be supported at 10-foot intervals.

(c) Copper tubing shall be supported at not more than 6-foot intervals. Hangers for copper tubing shall have proper size rings to suit outside diameter of tubing and shall be copper plated.

(d) Piping in earth shall be laid on a firm bed for its entire length, except where support is otherwise provided.

(2) Vertical Piping. - Supports shall be spaced as specified hereinafter, and at locations not more than 8 feet from end of riser. Pipe clamps shall be type 32.

(a) Cast-iron and threaded pipe shall be supported at each floor and at intervals of not more than 20 feet.

(b) Copper tubing shall be supported at each floor, and between floors by stays or braces to prevent rattle and vibration.

c. Fixture and Equipment Supports and Fastenings. - Fixtures and equipment shall be supported and fastened in a satisfactory manner. Where secured to concrete or brickwork walls, fixtures and equipment shall be fastened with brass bolts or machine screws in lead or corrosion-resisting metal sleeve-type anchorage units or with brass expansion bolts. Expansion bolts shall be 1/4-inch brass bolts with 20 threads to the inch and of sufficient length to extend at least 3 inches into solid concrete or brickwork, and shall be fitted with loose tubing or sleeves of proper length to bring expansion sleeves into the solid concrete or brick wall. Where secured to wood partitions, fixtures and equipment shall be fastened with brass wood screws. Where wood screws are used, screws shall go into solid wood, such as wood inserts, floor joists, studs, or solid pieces set between studs. Exposed heads of bolts and nuts shall be hexagonal with rounded tops finished and chromium-plated, with chromium-plated hexagonal nuts to conceal end of bolts where exposed. Exposed nuts and heads of screws shall be provided with chromium plated brass washers.

35-18. FLOOR, WALL, AND CEILING PLATES. - Uncovered exposed pipes, where passing through floors, finished walls, or finished ceilings, shall be fitted with chromium-plated or enameled cast-iron or steel plates. Plates shall be large enough to completely close the hole around the pipes and shall be square, octagonal, or round, with the least dimension not less than 1-1/2 inches larger than the diameter of the pipe. Plates shall be secured in an approved manner.

35-19. ELECTRICAL WORK. - Motors, controls, and switching and protective devices required for the proper operation of the equipment shall be furnished under this section of the specifications and shall conform to ELECTRICAL WORK, INTERIOR. Motor controllers and protective and signal devices for motor circuits shall be installed and connected under ELECTRICAL WORK, INTERIOR, except where such apparatus is furnished mounted and connected integral with the motor-driven equupment. Final connections to electrical equipment, including motors, together with the installation and connections to all related control and protective equipment, shall be accomplished as a part of the electrical work under ELECTRICAL WORK, INTERIOR. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical control device shall be submitted to the Contracting Officer for approval.

35-20. PAINTING. - Pipe hangers, supports, and other iron work concealed or in unfinished spaces shall be thoroughly cleaned and painted with one coat of black asphaltum varnish. Finish painting of exposed pipe, pipe covering, hangers, supports, and other iron work shall conform to Section, PAINTING.

35-21. ELECTRICAL WATER HEATER. - Electric water heater shall conform to Federal Specification W-H-196, type II, size 30. Tank shall be constructed of a non-ferrous metal. Thermostats adjustable range shall have a maximum setting of 105° F.

35-22. TYPES OF FIXTURES AND FIXTURE TRIMMINGS. - Types of fixtures and fixture trimmings specified herein shall be furnished and installed complete with all trimmings and fittings, unless otherwise specified under the item. The item numbers correspond with the "F" numbers notched at the plumbing fixtures on the drawings.

a. General Requirements. - References made herein to outfit numbers and figure numbers of vitreous china and enameled cast-iron plumbing fixtures are to Federal Specification WW-P-541, unless otherwise indicated. Fixtures and trimmings not covered by Federal Specification WW-P-541 shall be considered special, but shall be of equal quality and material. Generally, all fixtures except water closets and urinals shall have the water supply above the rim. Fixtures with the supply discharge below the rim shall be equipped with backflow preventers. Angle stops

straight stops, stops integral with the faucets, or concealed type of lock-shield loose-key pattern stops for supplies shall be furnished and installed with fixtures. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping systems at the wall unless otherwise specified under the item. Floor and wall plates and escutcheons shall be as specified hereinbefore or as covered by the outfit numbers. The exposed fixture trimmings and fittings shall be chromium-plated on nickel-plated brass with polished bright surfaces conforming to Federal Specification WW-P-541.

b. Cross Connections. - Fixtures and trimmings shall be designed to prevent the backflow of polluted water or waste into the water-supply system.

c. Fixture Connections. - Where space conditions will not permit standard fittings in conjunction with the cast-iron floor flanges, special short-radius fittings shall be provided. Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gastight and watertight with a closet-setting compound in accordance with Federal Specification HH-C-536, or with gaskets in accordance with Federal Specification HH-G-116. Rubber gaskets or putty will not be permitted for these connections. Bolts shall be not less than 1/4-inch in diameter and shall be equipped with chromium-plated nuts and washers. Fixture with outlet flange shall be set the proper distance from floor or wall to make a first-class joint with the closet-setting compound or gasket and fixture used; no fixture shall be set in place until the Contracting Officer has examined and approved such flange.

d. Flush Valves. - Flush valves shall be of the non-hole-open type.

e. Fixtures. -

(1) P-1, Water Closet; Outfit VW9, Figure 10.03.
(2) P-2, Urinal; Outfit VU13W, Figure 10.10 wall-mounted, without chair carrier.
(3) P-3, Lavatory; Outfit EL20B, Figure 11.04.
(4) P-3A, Lavatory; Outfit VL24P, Figure 10.18
(5) P-4, Sink; Outfit EK30S, Figure 11-05.
(6) P-5, Sink; Outfit EK24GF, Figure 11.11. Provide Hudee ring for installation in counter top.
(7) P-6, Laundry Tray; Outfit MT48, Figure 14.05. Trap shall be type 106.
(8) P-30, Drinking Fountain; Outfit VD13, Figure 10.23.
(9) P-24, Tub; Outfit EB60DL, with Figure SCC Shower with Curtain rod.
(10) P-7, Shower, similar or equal to Speakman Company #S-2077 complete with self closing valve and chain.

(11) P-8, Shower; similar or equal to Speakman Company #S-2085, complete with self closing valve, air chamber, chain, and pulleys.

(12) P-30A, Drinking Fountain; Outfit VD-10, figure 10.22.

(13) P-9, Chemical toilet shall have standard size and shape toilet seat with removable inner container and attached section for insertion of charcoal deodorizer. Toilet shall be constructed of zinc-coated bonderized steel with white enamel finish. Inner container shall have porcelain enamel finish. Toilet shall be complete with 2 pounds of charcoal deoderizer and 2 gallons of chemical.

35-23. HYDROPNEUMATIC TANKS. - The hydropneumatic tanks shall have a capacity of not less than 220 gallons for the Utility Building, and not less than 80 gallons capacity for the Operator's Quarters. The tanks shall be of galvanized steel and constructed in accordance with ASME Boiler and Pressure Vessel Code, Section VIII, Unfired Pressure Vessels, for 100 psig working pressure. The tanks shall be installed in the vertical position on a suitable steel base ring. The base rings shall be approximately 6 inches high shall be fabricated of 5/16" thick steel and shall be fastened to the floor by clip angles and stud bolts. The base ring shall be provided with cut-outs of adequate size to permit installation and servicing of the tank drain line. The utility building tank shall be provided with a 4-inch x 6-inch handhole, and shall be tapped to receive the inlet and discharge piping, pressure relief valve, air line, pressure gauge, sight glass, and taps for the automatic control connections; location of the control taps shall be determined by the manufacturer of the control equipment. The operator's quarters tank shall be tapped for inlet and outlet discharge piping, pressure relief valve, pressure gauge, sight glass and air volume control.

a. Sight Glass Connections. - A sight glass shall be installed on the tanks. The lower connection shall not be more than 3-inches above the bottom of the straight tank wall and the upper connection shall be no lower than the mid-height of the tank.

b. Pump Controller Connections. - The taps for the pump controller connections shall be set in accordance with the manufacturers recommendations. (Applies to tank in Utility Building only).

c. Air Volume Control. - An air volume control as recommended by the pump manufacturer shall be installed on the tank at the Operator's Quarters only, and connected by copper tubing to the air check valve in the pump.

d. Pressure Gage. - Install an accessible, easily read pressure gage of an approved Bourdon-Spring type on both tanks.

e. Pressure Relief Valve. - A pressure relief valve shall be installed on the top of the tanks and set for pressure relief at 90 p.s.i.g.

f. Air Compressor Unit. - (1) The air compressor shall be of the vertical or vee type, motor driven through suitable V-belt and shall be air-cooled. Compressor shall be mounted on suitable vibration isolators. The belt guard shall be fully guarded. The motor and compressor shall be mounted on a single base which shall be securely anchored to the concrete floor. Capacity of the compressor shall be approximately 1.7 cfm free air at 100 p.s.i.g.

(2) The unit shall be complete with 120/208 volt 3 phase, 60 cycle electric motor, motor magnetic starter, separate hand off automatic selector switch pressure gage and a safety valve set to relieve at 90 p.s.i.g.

g. Pressure Switch. - A double pole pressure switch rated 250 volt suitable for use with operating coil of magnetic motor starter shall be installed on the discharge pipe between the pump and hydropneumatic tank at the Operator's Quarters.

h. Combination Pump and Air Control. - A combination pump and air volume control shall be furnished and installed as shown on the drawings for the Utility Building and specified herein. The control shall start the jet well pump when the water level in the hydropneumatic tank reaches the predetermined low level and stop the pump when the water level reaches the predetermined high level. Should the air pressure in the tank fall below the 60 psi pressure, when the water in the tank is at the high level, the control shall operate the air compressor until the required 60 psi pressure is restored. The control shall be mounted on the heater room wall, and shall be similar to an Automatic Control Co. Gougetrol Dutrol probe model or approved equal.

35-24. POTABLE WATER STORAGE TANK. - The potable water storage tank in the fallout shelter in the flood control gate shaft structure shall be of an eighty (80) gallon working capacity glass lined for long life; construction will be such that no rust will be added to the water. The tank shall be tapped for an inlet fill pipe, discharge pipe, vent pipe and sight glass and constructed for horizontal mounting. The tank shall be supported from the ceiling by means of two (2) 1/4-inch thick by 3-inch wide steel straps. The straps shall be anchored to the ceiling concrete slab by means of 5/8-inch diameter inserts, cast-in-place. The location will be such that the tank will not interfere with the ceiling beams and the discharge outlet is located over the sink below. The fill pipe shall extend up to the operator's floor and a suitable screwed cap be provided, and air gap shall be provided between the fill pipe and tank.

35-25. DECONTAMINATION WATER SUPPLY. - a. General. - Complete system includes water pump unit mounted on top of a 40 gallon hydropneumatic tank. The tank material and installation shall conform to Paragraph 35-23 of this section. Rubber grommets shall be installed between the pump motor unit and the tank and a rubber hose connection

between the pump and tank to reduce operating sound to a minimum. All cast iron parts coming in contact with the water are to be protected with baked-on coating to resist rust and corrosion in the pump. The pump impeller shall be bronze, the guide vane and diffuser shall be of a material that is noncorrosive, non-toxic, highly resistant to abrasion. Pump motor shall be of fractional horsepower and shall operate on 120 volts, 60-cycle single phase current. Motor shall be of the capacitor type, and have built-in overload protection.

Pump shall have a capacity of 400 gallons per hour against a discharge pressure of 40 p.s.i. Pump shall operate under a flooded suction condition. The air volume control and adjustable pressure switch shall conform to the applicable portions of the paragraph on hydropneumatic tanks of this section. The pressure switch shall be set to operate when the pressure drops to 20 p.s.i. in the tank and stop the pump when the pressure reaches 40 p.s.i.

b. Suction Pipe. - The suction pipe from the 500 gallon storage tank to the pump shall be wrought iron or copper tubing and conform to the applicable paragraphs under "Water and Sewer Systems". The pipe shall be 1-1/4 inch in size and reduced at the pump to fit the pump suction connection. A 1-1/4 inch globe valve shall be installed on the suction pipe before it connects to the pump. The 1-1/4 inch pipe shall be sleeved through the basement wall in a 2-inch watertight pipe sleeve.

c. Vent Pipe. - The vent pipe from the 500 gallon storage tank shall terminate in the basement fallout shelter room. The one (1) inch vent pipe shall be copper tubing or wrought iron pipe as specified under "Water and Sewer Systems". The vent pipe shall be sleeved through the basement wall in a 2-inch watertight sleeve.

35-26. INSPECTION AND TESTS. - a. Methods of Sampling, Inspection, and Tests for Fixtures. - Methods of sampling, inspection, and tests for fixtures shall conform to Federal Specification WW-P-541.

b. Tests for Plumbing Systems. - Soil, waste, vent, and water piping shall be tested by the contractor and approved by the Contracting Officer before acceptance. Soil and waste piping located underground shall be tested before backfilling. Equipment required for test shall be furnished by the contractor without additional cost to the Government.

(1) Drainage System. - (a) Water Test. - The entire drainage and venting system shall have all necessary openings plugged to permit the entire system to be filled with water to the level of the highest vent stack above the roof. The system shall hold this water for 30 minutes without showing a drop greater than 4 inches. Where a portion of the system is to be tested, the test shall be conducted in the same manner as described for the entire system, except that a vertical stack 10 feet above the highest horizontal line to be tested may be installed and filled with water to maintain sufficient pressure, or a pump may be used to supply the required pressure. The pressure shall be maintained for 30 minutes.

(b) Air Test. - If tests are made with air, a pressure of not less than 5 pounds per square inchs shall be applied with a force pump and maintained at least 15 minutes without leakage. A mercury-column gage shall be used in making the air test.

(c) Final test of the completed drainage and vent system may be either a smoke or a peppermint test. When the smoke test is employed, the smoke shall be produced by a smoke machine, and a pressure equal to 1-inch water column shall be maintained for 15 minutes before starting inspection. When the peppermint test is preferred, 2 ounces of peppermint shall be introduced into each line or stack. Defects discovered shall be eliminated by resetting the fixtures and equipment with new gaskets.

(2) Water System. - Upon completion of the roughing-in and before setting fixtures, the entire hot-and cold-water piping systems shall be tested at a hydrostatic pressure of not less than 100 pounds per square inch gage, and proved tight at this pressure for not less than 30 minutes in order to permit inspection of all joints. Where a portion of the water-piping system is to be concealed before completion, this portion shall be tested separately in a manner described for the entire system.

(3) Defective Work. - If inspection or test shows defects, such defective work or material shall be replaced and inspection and tests repeated. Repairs to piping shall be made with new material. No calking of screwed joints or holes will be acceptable.

(4) Cleaning and Adjusting. - At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves, and fittings shall be cleaned of grease, metal cuttings, and sludge which may have accumulated by operation of the system for testing. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings, due to the contractor's failure to properly clean the piping system, shall be repaired by the contractor without cost to the Government. At the completion of the work, the hot-water system shall be adjusted for uniform circulation. Flush valves and other parts of the work shall be adjusted for quiet operation. Automatic control devices shall be adjusted for proper operation.

35-27. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed in accordance with the guarantee provisions set forth in the SPECIAL CONDITIONS;

Air Compressor Unit
Plumbing Fixtures
Pneumatic Tanks and Controls
Electric Hot Water Heater
Pressure Relief Valve
Decontamination Water Supply Pump

35-28. PAYMENT. - No separate payment will be made for the work covered under this section, and all costs in connection therewith shall be included in the applicable lump-sum contract prices for the following items of work:

a. Operator's Quarters (Item 97)

b. Utility Building (Item 96)

c. Flood Control Gate Shaft - Miscellaneous (Item 68)

d. Water Supply Intake Tower - Miscellaneous (Item 69)

SECTION 36

HEATING SYSTEM: FORCED-HOT-WATER, OIL-FIRED

(INDEX)

Paragraph No.	Paragraph Title	Page No.
36-01	Scope	36-1
36-02	Applicable Publications	36-1
	a. Federal Specifications	36-1
	b. Military Specification	36-2
	c. U. S. Department of Commerce Commercial Standard	36-2
	d. U. S. Department of Commerce Simplified Practice Recommendation	36-2
	e. American Society for Testing Materials Standards	36-3
	f. American Society of Mechanical Engineers Publication	36-3
	g. American Standards	36-3
	h. Mechanical Contractors Association of American Standards	36-3
	i. Institute of Boiler and Radiator Manufacturers Code	36-3
	j. National Board of Fire Underwriters Standard	36-3
36-03	General	36-3
	a. Standard Products	36-4
	b. Approval of Materials and Equipment	36-4
36-04	Materials and Equipment	36-4
	a. Asphalt Varnish	36-4
	b. Boiler Covering	36-4
	c. Electical Materials and Appliances	36-5
	d. Firebrick	36-5
	e. Fire Clay	36-5
	f. Iron and Steel Sheets	36-5
	g. Mechanical Equipment	36-5
	h. Pipe and Pipe Fittings	36-5

Paragraph No.	Paragraph Title	Page No.
	i. Pipe Covering	36-5
	j. Valves	36-6
	k. Welding Fittings	36-6
36-05	Workmanship	36-6
36-06	Boiler	36-6
36-07	Oil Burning Equipment	36-7
	a. Oil Burner	36-7
	b. Motor	36-8
	c. Automatic-Draft Regulator	36-8
	d. Fuel-Oil Storage Tanks	36-8
	e. Pipe and Fittings	36-9
36-08	Combustion Chamber	36-9
36-09	Foundations	36-9
36-10	Smoke Connections	36-9
36-11	Pressure Gage and Thermometer	36-10
36-12	Pressure Relief Valves	36-10
36-13	Drains	36-10
36-14	Circulating Pump	36-10
36-15	Controls	36-10
	a. General	36-10
	b. Safety Controls	36-11
	c. Water-Temperature Controller	36-11
	d. Thermostats	36-11
36-16	Cold-Water Connection	36-11
	a. Relief Valves	36-12
	b. Strainers	36-12
	c. Pressure-Regulating Valve	36-12
36-17	Expansion Tank	36-12
36-18	Piping	36-12

Paragraph No.	Paragraph Title	Page No.
	a. Branch Connections	36-13
	b. Risers	36-13
	c. Joints	36-13
	d. Pipe Supports	36-13
	e. Pipe Sleeves	36-13
	f. Floor, Wall, and Ceiling Plates	36-13
36-19	Painting	36-14
36-20	Unit Heaters for Utility Building	36-14
	a. General	36-14
	b. Heating Element	36-14
	c. Motors	36-15
	d. Control	36-15
36-21	Installation of Valves	36-15
	a. General	36-15
	b. Flow Control Valve	36-15
	c. Motor-Operated Valve	36-15
	d. Air Vents	36-15
36-22	Boiler Covering	36-16
36-23	Pipe Covering	36-16
36-24	Electrical Work	36-16
36-25	Painting and Finishing	36-16
36-26	Operating and Maintenance Instructions	36-17
36-27	Tests	36-17
36-28	Cleaning of Boilers and Piping	36-18
36-29	Optional Controls	36-18
	a. Pneumatic Controls	36-18
36-30	Guaranty	36-18
36-31	Payment	36-18

SECTION 36

HEATING SYSTEM: FORCED-HOT-WATER, OIL-FIRED

36-01. SCOPE. - This section covers the installation of the forced-hot-water heating system, complete, for the Utility Building and the Operator's Quarters.

36-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specifications. -

HH-B-671d	Brick; Refractory, Fire Clay.
HH-C-168	Cement, Insulation; Thermal, Mineral-Wool.
HH-C-451c	Clay; Fire, Ground.
HH-I-523a & Am-2	Insulation Block, Pipe Covering, and Cement, Thermal, Calcium Silicate (for Temperatures Up to 1200°F.).
HH-I-551a & Am-2	Insulation Block and Pipe Covering, Thermal Cellular Glass.
HH-I-552	Insulation Pipe Covering, Thermal, and Insulation Blanket, Thermal, Pipe Covering.
HH-I-554	Insulation, Thermal, Magnesia, Block, Pipe and Tubing.
HH-I-561c & Int. Am-1	Insulation, Thermal, Asbestos, Block and Pipe-Covering (For Temperatures Up to 750°F.).
HH-I-564	Insulation; Mineral-Wool, Block and Board (for Heated Surfaces).
HH-I-578a	Insulation, Vermiculite; Block and Pipe Covering (Molded).
HH-P-46b	Packing; Asbestos, Sheet, Compressed.

QQ-S-636	Steel; Carbon (Low-Carbon), Sheets, and Strips.
QQ-S-775a	Steel Sheets, Carbon, Zinc-Coated.
TT-V-51c	Varnish; Asphalt.
VV-F-815 & Am-1	Fuel Oil Burner.
WW-N-351a	Nipples, Pipe, Threaded.
WW-P-406b	Pipe, Steel (Seamless and Welded) (For Ordinary Use).
WW-P-501c	Pipe Fittings, Cast Iron, Screwed 125 and 250 Pound.
WW-P-521d & Am-1	Pipe Fittings, Malleable Iron, Wrought Iron and Steel, (Screwed), 150 Pound.
WW-U-531a	Union, Pipe, Steel or Malleable Iron, Threaded Pipe Connection, 250 p.s.i. WSP; 500 p.s.i. WOG (Cold Nonshock).
WW-V-0051b	Valves, Bronze; Angle, Check and Globe, 125 and 150 Pound, Screwed and Flanged (For Land Use).
WW-V-0054a (GSA-FSS)	Valves, Bronze, Gate, 125 and 150 Pound Screwed and Flanged (For Land Use)
WW-V-58	Valves, Cast-Iron, Gate; 125 and 250-lb. Screwed and Flanged (For Land Use)
GGG-P-351a	Pipe-Threads; Taper (American-National).

b. Military Specification. -

MIL-P-15147c	Primer and Enamel, Coal Tar.

c. U. S. Department of Commerce Commercial Standard. -

CS75-56	Automatic Mechanical-Draft Oil Burners Designed for Domestic Installations.

d. U. S. Department of Commerce Simplified Practice Recommendation. -

R157-50	Steel Firebox Boilers and Steel Heating Boilers (Commercial and Residential Types).

e. American Society for Testing Materials Standards. -

A 42-60T	Wrought-Iron Plates.
A 53-58aT	Welded and Seamless Steel Pipe.
A 234-59T	Factory-Made Wrought Carbon Steel and Ferritic Alloy Steel Welding Fittings.
A 285-57T	Low and Intermediate Tensile Strength Carbon-Steel Plates of Flange and Firebox Qualities, Plates 2 Inches and Under in Thickness.

f. American Society of Mechanical Engineers Publication. -

Boiler and Pressure Vessel Code. Section IV Low Pressure Heating Boilers; Section VIII Unfired Pressure Vessels.

g. American Standards. -

B16.9-1958	Steel Built-Welding Fittings.
B19.1938	Safety Code for Compressed-Air Machinery and Equipment.

h. Mechanical Contractors Association of American Standards. -

Net Load Recommendations: Heating Boilers, Baseboard, Convectors, Finned-Tube; Testing and Rating Code for Boiler-Burner Units.

i. Institute of Boiler and Radiator Manufacturers Code. -

Testing and Rating Code for Finned-Tube (Commercial) of Radiation.

j. National Board of Fire Underwriters Standard. -

No. 31	Installation of Oil Burning Equipment (Current Issue).

36-03. GENERAL. - The contract drawings indicate the extent and general arrangement of the heating systems. If any departures from the contract drawings are deemed necessary by the contractor, details of such departures and the reasons therefor shall be submitted in writing as soon as practicable to the Contracting Officer for approval. No such departures shall be made without the prior written approval of the

49

Contracting Officer. The dimensions of boiler or equipment rooms are as indicated on the drawings. Equipment and piping arrangements shall provide adequate and acceptable clearances for entry, servicing, and maintenance.

a. Standard Products. - The equipment to be furnished under this specification shall be essentially the standard product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer.

b. Approval of Materials and Equipment. - As soon as practicable and within 30 days after the date of award of the contract, and before commencement of the installation of any materials or equipment, a plan and elevation of the boiler or equipment-room layout showing the proposed piping and equipment, with clearances, together with a complete schedule of the materials and equipment proposed for installation shall be submitted in six copies for the approval of the Contracting Officer. The schedule shall include catalogs, cuts, diagrams, drawings, and such other descriptive data as may be required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of equipment under this provision shall not be construed as authorizing any deviations from the specification, unless the attention of the Contracting Officer has been directed to the specific deviations. Equipment differing from that specified may be proposed, provided the contractor clearly states such differences and provided all essential requirements of the specification are met. If the equipment offered under this provision is, in the opinion of the Contracting Officer, equal to or better than that specified, it will be given consideration.

36-04. MATERIALS AND EQUIPMENT. - The following materials and equipment shall conform to the respective specifications and other requirements specified below.

a. Asphalt Varnish. - Federal Specification TT-V-51.

b. Boiler Covering. - (1) Calcium Silicate. - Federal Specification HH-I-523.

(2) Cellular Glass. - Federal Specification HH-I-551.

(3) Magnesial - Federal Specification HH-I-554, types required for use intended.

(4) Mineral-Wool. - Federal Specification HH-I-564 or HH-I-552, type 1, class A or class B.

(5) Mineral-Wool Insulation Cement. - Federal Specification HH-C-168.

c. Electrical Materials and Appliances. - ELECTRICAL WORK, INTERIOR, of these specifications.

d. Firebrick. - Federal Specification HH-B-671, low duty.

e. Fire Clay. - Federal Specification HH-C-451, class C.

f. Iron and Steel Sheets. - (1) Uncoated (black) Steel Sheets. - Federal Specification QQ-S-636, composition, condition, and finish best suited to the end use.

(2) Galvanized Iron and Steel Sheets. - Federal Specification QQ-S-775, class d.

g. Mechanical Equipment. - Major items of mechanical equipment shall be of the best quality normally used for the purpose in good commercial practice and shall be the products of reputable manufacturers. Each major compoment of equipment shall have the manufacturer's name, address, and catalog number on a nameplate securely affixed in a conspicuous place. The nameplate of a distributing agent only will not be acceptable. Belts, pulleys, chains, gears, couplings, projecting set screws, keys, and other rotating parts located so that any person may come in close proximity thereto shall be fully enclosed or properly guarded.

h. Pipe and Pipe Fittings. - (1) Asbestos Packing. - Federal Specification HH-P-46.

(2) Cast-Iron Pipe Fittings. - Federal Specification WW-P-501, class A, type required to match adjacent piping.

(3) Malleable-Iron Pipe Fittings. - Federal Specification WW-P-521, type required to match adjacent piping; or in lieu thereof for sizes 2 inches and smaller, brazing-type fittings employing silver solder.

(4) Nipples. - Federal Specification WW-N-351, type A.

(5) Pipe. - Federal Specification WW-P-406, weight A, class 1, coating as hereinafter specified, and the American Society for Testing Materials Standard A 53.

(6) Pipe Threads. - Federal Specification GGG-P-351.

(7) Unions. - Federal Specification WW-U-531, type required to match the adjacent piping.

i. Pipe Covering. - (1) Asbestos. - Federal Specification HH-I-561, type II, III, or IV, class 2.

49

(2) Calcium Silicate. - Federal Specification HH-I-523, class 2.

(3) Cellular Glass. - Federal Specification HH-I-551.

(4) Magnesia. - Federal Specification HH-I-554.

(5) Mineral-Wool. - Federal Specification HH-I-552, type I, class A.

(6) Vermiculite. - Federal Specification HH-I-578, type I.

j. Valves. - (1) Gates. - Sizes 1-1/2 inch or less, Federal Specification WW-V-54, class A; 2-inch size, Federal Specification WW-V-58, class A, designation NS; over 2-inch size, Federal Specification WW-V-58, class A, designation OS or OF as required.

(2) Globe. - Federal Specification WW-V-51, type I, class A.

(3) Angle. - Federal Specification WW-V-51, type II, class A.

(4) Radiator. - The quick-opening, disk type designed specially for forced hot-water heating systems, constructed of brass or bronze and of the spring-retained-packing type with composition mushroom handles.

(5) Air. - The wooden handle operated heavy pattern type.

k. Welding Fittings. - Welding fittings shall conform to ASTM Standard A 234. Wrought-iron fittings shall conform in physical and chemical properties to ASTM Standard A 72 or A 42. All welding fittings shall conform to American Standard B16.9.

36-05. WORKMANSHIP. - Equipment shall be installed in accordance with the recommendations of the manufacturer and the best standard practice for this type of work.

36-06. BOILER. - Boiler shall be designed for a water-working pressure of 30 pounds per square inch gage, and shall be constructed and equipped in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The boiler shall be provided with the necessary connections, and shall be equipped with a combined pressure gage and thermometer, a water-temperature regulator, a water-relief valve and a built-in tankless heater. The tankless heater for the

Operator's Quarters shall be rated 5 gpm and for the Utility Buildings, 3 gpm. The boiler shall have a standard nameplate containing the manufacturer's name and address and the trade name and catalog number of the boiler, securely affixed in a conspicuous place. The boiler shall fit the space requirements of the boiler room allowing adequate room for cleaning and maintenance. The capacity of the boiler, based on the ratings in the Net Load Recommendations for Heating Boilers of the Heating, Piping, and Mechanical Association Standards, or determined by the method shown in U. S. Department of Commerce Simplified Practice Recommendation R157, shall be not less than shown on the drawings. The boiler shall have the required capacity when fired with No. 2 fuel oil. The boiler shall be of cast iron and shall be of the rectangular, sectional type specially designed for use with an oil burner and may be jacketed or unjacketed. Unjacketed boilers shall be insulated as hereinafter specified.

36-07. OIL-BURNING EQUIPMENT. - Oil-burning equipment shall include the oil burner, motor, ignition equipment, controls, oil-storage tank, oil pipe and fittings, and all other items necessary for the complete installation of a fully automatic oil-burning heating system. All fuel-oil-burning equipment shall be installed in accordance with Pamphlet No. 31 of the National Board of Fire Underwriters, and shall conform to the requirements of the Underwriters' Laboratories, Inc. The contractor shall submit proof that each item of oil-burning equipment he proposes to furnish conforms to these standards. The label or listing of the Underwriters' Laboratories, Inc., will be accepted as evidence of conforming to this requirement. In lieu of such label or listing the contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the oil-burning equipment has been tested and conforms to the standards, including the method of test, of the Underwriters' Laboratories, Inc.

a. Oil Burner. - Oil burner shall be of the mechanical or air-atomization type suitable for handling No. 2 commercial fuel oil without preheating the oil. The burner shall be quiet in operation, and shall operate with a balanced flame so as not to localize heat in any part of the combustion chamber. The burner shall be capable of complete atomizing and effectively mixing the oil with air so as to insure complete combustion. The air admitted shall be of sufficient quantity for complete combustion, but not of such quantity as to produce an undue percentage of excess air with attendant high stack loss. The oil burner shall operate without clogging or failure, and shall have sufficient capacity to develop not less than the specified boiler capacity. The oil burner shall conform to U. S. Department of Commerce Commercial Standard CS75 when within the scope thereof. The burner units shall be readily accessible for inspection, cleaning, and other purposes. Each burner shall have synchronized control of the quantity of oil, primary air, and secondary air to be supplied. Burners for No. 2 oil shall be equipped with either direct electric ignition or electric-spark-ignited pilot ignition systems.

4/9

b. Motor. - Motor shall be of the totally enclosed type and shall be provided with thermal-overload protection. The motor shall suit the current characteristics indicated on the drawings and shall conform to the applicable requirements of ELECTRICAL WORK, INTERIOR. The motor shall have sufficient capacity to operate the oil pump and fan so as to develop the specified boiler rating.

c. Automatic-Draft Regulator. - Automatic-draft regulator shall be installed in the side of each smoke pipe. The regulator shall consist of a weighted and balanced damper of proper size for the boiler capacity. The damper shall open or close automatically as the chimney draft varies, so as to maintain a constant draft at the furnace outlet.

d. Fuel-Oil Storage Tanks. - Fuel-oil storage tanks shall have a capacity as indicated on the drawings. Each tank shall be constructed in accordance with the standards of Pamphlet No. 31 of the National Board of Fire Underwriters and certification to that effect shall be furnished to the Contracting Officer. The tank shall be provided with welded, reinforced threaded openings or flanges for all pipe connections including oil-fill, vent and oil-burner connections. An oil-level indicating device of the hydraulically operated type shall be installed in conjunction with each oil-storage tank.

(1) Cleaning and Painting of Underground Tanks. - The exterior surfaces shall be prepared for painting by steel-grit or sand blasting. Prior removal of oil, grease, and other foreign matter by solvents or mechanical means will not be required provided that blast cleaning alone accomplishes the complete removal of mill scale, rust, oil, grease, welding slag, and other surface contaminants and leaves a surface of uniform appearance, suitably roughened for tenacious adhesion of the coating. As soon after blasting as practicable, and prior to formation of any form of corrosion, the exterior surfaces shall be given a coat of coal-tar primer conforming to Military Specification MIL-P-15147. The primer shall not be heated but shall be applied at temperatures between 60°F. and 80°F. with the relative humidity below 80 percent. At the option of the contractor, surface preparation and priming may be performed either in the manufacturer's plant or in the field. If performed in the plant, the surfaces of the tank shall be thoroughly cleaned in the field of all dirt and debris and inspected for evidence of loose primer, holidays, and areas of primer damaged in transit. All such areas shall be cleaned so as to expose the bright metal, and the entire surface shall be reprimed. After the field-primed, or reprimed, surfaces have dried thoroughly and before expiration of the maximum drying time stipulated by the manufacturer of the coating, a coat of coal-tar enamel conforming to Military Specification MIL-P-15147 shall be hot-applied so as to obtain a dry film thickness

of not less than 1/16-inch. The use of fluxing oils or thinners to reduce susceptibility to cracking in cold weather will not be permitted. Enameling shall be done by men who are thoroughly and specifically experienced in the application of coal-tar enamel and in strict accordance with the recommendations of the coating manufacturer. After the enamel is completely applied and cold, all coated surfaces shall be tested with an electric wire-brush holiday detector operating at 8,000 to 10,000 volts. Any missed places revealed by the test shall be promptly repaired by a single application of hot enamel. Coated tanks shall be handled in a manner which will preclude damage to the coating by impact or abrasion. The excavation shall have a suitably prepared bed, and the tank shall not be dumped or dropped but shall be carefully placed with a minimum of handling. Backfill shall be compacted thoroughly, but with care exercised to avoid damage to the coating.

(2) Cleaning and Painting Above-Ground Tanks. - The exterior surfaces shall be cleaned thoroughly of all loose rust, blisters, loose scale, oil paint of type different from primer and other substances that would interefere with proper adhesion of the protective coating. Mill scale that cannot be removed by hand wire brushing need not be removed. Oil and grease shall be removed with mineral spirits or other acceptable solvent having a flash point higher than 80 degrees F. After cleaning, the outside of the tank shall be painted with one coat of red lead and two coats of aluminum paint conforming to requirements of the "Painting" section.

e. Pipe and Fittings. - Fill and vent piping shall be standard-weight black-steel pipe with malleable iron fittings. Supply and return lines shall be type "K" copper tubing with flared joint type compression fittings. A "Scully" or approved equal, vent alarm shall be installed with each tank.

36-08. COMBUSTION CHAMBER. - Combustion chamber shall be constructed of firebrick laid in thin fire clay batter. The use of plastic or other refractory material in lieu of firebrick will be acceptable provided the setting is recommended by the manufacturers of the boiler and fuel-burning equipment.

36-09. FOUNDATIONS. - Foundations for the boiler and for other heating equipment covered by this specification, when required, shall be constructed in strict accordance with the manufacturers' recommendations and as approved.

36-10. SMOKE CONNECTIONS. - Each boiler shall be connected to the stack or flue by means of a smoke connection constructed of black iron or steel sheets not less than 0.0478 inch in thickness (18 gage). The clear distance between uncovered smoke connections and combustible

material or construction, including plaster on combustible base, shall be not less than 18 inches. The clearance may be reduced to 9 inches where the smoke connection is protected by not less than 1 inch of asbestos or its equivalent or where combustible material in ceilings, beams, or walls is protected by sheet metal or equivalent covering placed at least 1 inch from the surface to be protected and extending the full length of the smoke connection and not less than 12 inches beyond it on both sides. Suitable cleanouts shall be provided which will permit cleaning the entire smoke connection without dismantling.

36-11. PRESSURE GAGE AND THERMOMETER. - Pressure gage and thermometer, in combination, having suitable pressure and temperature ranges shall be installed on each boiler.

36-12. PRESSURE RELIEF VALVES. - Each boiler shall be provided with one or more relief valves, constructed and installed in strict accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The aggregate relieving capacity of the relief valves shall be not less than that required by the above Code. The discharge from the valves shall be installed as directed.

36-13. DRAINS. - Drains consisting of 1-inch hose gate valves or 3/4-inch hose bibs shall be installed at the lowest point in the return main near the boiler, and wherever required by the Contracting Officer for the convenient and thorough draining of the system.

36-14. CIRCULATING PUMP. - Circulating pump for hot water shall be of the single-stage, centrifugal type, electrically driven. The pump shall be supported by the piping on which it is installed. The pump shall have a capacity not less than that indicated on the drawings, and shall be integrally mounted with the motor on a cast-iron or steel sub-base. The pump may be either direct-connected by means of a flexible-shaft coupling or close-coupled with an overhung impeller. The pump shaft shall be constructed of steel, the runners and glands of bronze, and the housing of close-grained cast iron. The motor shall have sufficient power for the service required, shall be of a type approved by the manufacturer of the pump, shall be suitable for the available electric service, and shall conform to ELECTRICAL WORK, INTERIOR.

36-15. CONTROLS. - a. General. - (1) Water-Temperature Control. - The boiler water shall be maintained at a fairly constant temperature by means of a water-temperature controller which will cause the oil burner to start or stop automatically as the boiler-water temperature falls below or rises above predetermined points.

(2) Space-Temperature Control. (a) Operators Quarters. - The temperature in the spaces to be heated shall be automatically controlled by means of a thermostat which will cause the circulating pump

to start or stop as the space temperature falls below or rises above predetermined points.

(b) Utility Building. - The radiators in the Utility Building shall be controlled by a room thermostat and a motor operated valve. The thermostat will cause the valve to open or close as the space temperature falls below or rises above the thermostat setting. The circulator shall be controlled by an outdoor thermostat which will cause the pump to start or stop as the outdoor temperature falls below or rises above 65°F. The unit heater shall be controlled as hereinafter specified.

b. Safety Controls. - The contractor shall submit proof that the safety controls conform to the standards of the Underwriters' Laboratories, Inc., or the Factory Mutual Laboratories. The label or listing of the above laboratories will be accepted as evidence of conformance. In lieu of such label or listing, the contractor may submit a written certificate from any nationally recognized testing agency, adequately equipped and competent to perform such services, that the safety controls have been tested and conform to the standards, including method of test, of the Underwriters' Laboratories, Inc., or the Factory Mutual Laboratories.

(1) Safety stack switch or an equivalent device shall automatically shut off the oil burner in case the oil fails to ignite on starting.

c. Water-Temperature Controller. - Water-temperature controller for the boiler water shall be of sturdy construction and shall be protected againsty dust and dampness. The thermostatic element shall be inserted in a separate socket installed in either the upper part of the boiler or in the hot-water supply line leaving the boiler. The controller shall operate on a 10°F. differential over an adjustable temperature range of approximately 100° to 220°F.

d. Thermostats. - (1) Room thermostats shall be of a lock-shielf type, equipped with thermometers, and designed to operate on a 2°F. differential over a temperature range of approximately 55°F. to 85°F. Room thermostats shall be set to maintain a room temperature of 70°F.

(2) Outdoor thermostats shall be of the adjustable two-position type with an operating range of approximately plus 20°F. to plus 70°F. and shall be provided with a suitable ventilated weather shelter.

36-16. COLD-WATER CONNECTION. - Cold-water connection shall be made to the water supply system as approved. Connections shall be made

with copper tubing or brass pipe and brass fittings and shall include gate valve, strainer, pressure-regulating valve, and relief valve, with the relief valve nearest to the boiler.

a. Relief Valve. - The pressure-relief valve shall be adjusted to open automatically when the pressure within the heating system rises above 30 pounds per square inch gage. The discharge from the relief valve shall be installed as directed by the Contracting Officer. The valve shall be equipped with a lever for manual operation.

b. Strainers. - Basket or Y-type strainers shall be of the same size as the pipe lines in which they are installed. The strainer bodies shall be heavy and durable, of the best-grade cast iron, with bottoms drilled and plugged. The bodies shall have arrows clearly cast on the sides to indicate the direction of flow. Each strainer shall be equipped with an easily removable cover and sediment basket. The basket shall be of not less than 0.025 inch thick (22-gage) sheet brass with small perforations of sufficient number to provide a net free area through the basket of at least 3.30 times that of the entering pipe. The flow shall be into the basket and out through the perforations.

c. Pressure-Regulating Valve. - Pressure-regulating valve shall be of a type which will not stick nor allow pressure to build up on the low side. The valve shall be set to maintain a terminal pressure of approximately 5 pounds per square inch in excess of the static head on the system and shall operate within a 2-pound maximum variation regardless of initial pressure and without objectionable noise under any condition of operation.

36-17. EXPANSION TANK. - The expansion tank for the hot water heating systems shall be of the capacity indicated on the drawings. It shall be constructed of steel in accordance with requirements of the ASME Boiler and Pressure Vessel Code, section VIII "Unfired Pressure Vessels" for a working pressure of 30 p.s.i. gage. The tank shall be coated with a suitable rust-inhibiting paint. Tappings shall be provided for a gage glass installation which shall be provided complete with gage cocks and guide rods, and shall be so arranged that the gages can be read easily and all valves will be accessible.

36-18. PIPING. - Pipes shall be cut accurately to measurements established at the building, and shall be worked into place without springing or forcing, properly clearing all windows, doors, and other openings. Excessive cutting or other weakening of the building structure to facilitate piping installation will not be permitted. Pipes shall have burs removed by reaming. Changes in direction shall be made with fittings, except that bending of pipe will be permitted, provided a

hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformations will not be acceptable. Boiler outlets shall be run full size to the main header. Unless otherwise indicated, horizontal supply mains shall pitch up in the direction of flow and return mains shall pitch down in the direction of flow with a grade of not less than 1 inch in 40 feet. Open ends of pipe lines and other equipment shall be properly capped or plugged during installation to keep dirt and other foreign material out of the system. Pipe not otherwise specified shall be black steel uncoated. Unless otherwise specified or shown on the drawings, final connections to appliances shall be made with malleable-iron unions.

a. Branch Connections. - Branches from the mains shall be taken off at an angle of 45° above the horizontal, unless otherwise indicated on the drawings. Connections shall be carefully made to insure unrestricted circulation, eliminate air pockets, and permit the complete drainage of the system. Branches taken from the tops of mains shall pitch up, and those taken from the bottom shall pitch down from the mains with a grade of not less than 1 inch in 10 feet.

b. Risers. - The locations of risers shown on the drawings are approximate. Exact locations of the risers shall be as approved by the Contracting Officer.

c. Joints. - Screw joints shall be made with tapered threads properly cut. Screw joints shall be made perfectly tight with a stiff mixture of graphite and oil, applied with a brush to the pipe threads only, and in no case to the fittings. Flanged joints shall be faced true, packed, and made up perfectly square and tight. Brazed joints shall be made tight with silver solder.

d. Pipe Supports. - All horizontal runs of pipe shall be securely supported. Suspended pipe shall be held by adjustable clevis-type pipe hangers having bolted hinged loops or by other approved devices. Chain or flat steel strap hangers will not be acceptable. Supports for pipes shall be spaced eight (8) feet on centers.

e. Pipe Sleeves. - All pipes passing through masonry or frame construction shall be fitted with sleeves. Each sleeve shall extend through its respective floor or wall, and shall be cut flush with each surface unless otherwise required. The inside diameter of pipe sleeves shall be at least one-half inch larger than the outside diameter of the passing pipe or pipe covering. Sleeves in bearing walls shall be steel pipe, cast iron pipe, or terra cotta pipe.

f. Floor, Wall, and Ceiling Plates. - All pipes passing through the floors, walls, or ceilings of finished rooms shall be fitted with chrome plated, wall, or ceiling plates securely fastened in place.

49

Where pipes pass through combustible materials, the opening shall be sufficiently large to provide 1-inch clearance between the pipe and the floor or partition.

36-19. RADIATORS. - Radiators shall be of the extended-surface, steel-tube type, and shall consist of suitable metal fins permanently bonded to steel pipe cores, threaded at each end for connecting to external piping. The return connection shall be made with a balancing union elbow. The supply and return connections shall be of the same size. Radiators shall have capacities not less than indicated on the drawings, determined either in accordance with the Institute of Boiler and Radiator Manufacturer's publication, "Testing and Rating Code for Finned-Tube (Commercial) Radiation," or the test procedure in Commercial Standard CS 140. Radiators shall be equipped with solid fronts, slotted-sloping-top cover grilles, fabricated from steel sheets not less than 9.0478 inch in nominal thickness, independently secured with brackets. Radiators shall be given a coat of rust-inhibiting primer before shipment. Baseboard radiation in Operator's Quarters shall be as shown on the drawings. The front panels shall be constructed of 20-gauge steel and the back panels of 24-gauge steel. The heating element shall consist of aluminum fins mechanically bonded to seamless copper tubing. All units shall be equipped with dampers for temperature control in each room. The length of heating element shall be as shown on the drawings. All accessories shall harmonize in appearance with the contours of the baseboard heating panels.

36-20. UNIT HEATERS FOR UTILITY BUILDING. - a. General. - The unit heater shall have capacities not less than shown on the drawings. The control valves shall be the same size as the supply connection shown on the drawings. The unit heaters shall be rated in accordance with the code adopted by the Industrial Unit Heater Association and the American Society of Heating and Ventilating Engineers, and shall have a b.t.u. capacity not in excess of 125 percent of that specified. Orifice plates may be provided to reduce the b.t.u. output where required. The unit heaters shall be quiet in operation. If, upon completion of installation, a unit heater is considered by the Contracting Officer to be objectionably noisy, it shall be replaced with an acceptable heater at no additional cost to the Government. The unit heaters shall be designed for suspension and arranged for horizontal discharge of air as indicated on the drawings. The casing shall be of sturdy, rigid construction and shall be finished with lacquer or enamel. Suitable, efficient air deflectors shall be provided. The face velocity of the unit heater shall not be in excess of 900 feet per minute.

b. Heating Element. - Heating coil and radiating fin shall be of copper or copper alloy. The heating element shall be free to expand or contract without developing leaks and shall be properly pitched for

drainage. The element shall be tested under a hydrostatic pressure of 200 p.s.i., and a certified report of the test shall be delivered to the Contracting Officer.

c. Motors. - Motors shall be provided with 3-position manual selection switches for "ON", "OFF", and "AUTOMATIC" operation; shall be equipped with thermal-overload protection; and shall be of suitable size and speed to operate the fans at their specified capacities. They shall be suitable for operation on a 115-volt, 60-cycle, single-phase circuit.

d. Control. - The unit heater shall be automatically controlled by a room thermostat which shall start and stop the unit heater fan as the space temperature falls below or rises above the thermostat setting.

36-21. INSTALLATION OF VALVES. - a. General. - Valves shall be installed at the location shown on the drawings or where specified. Gate valves shall be used unless otherwise shown, specified, or directed. All valves shall be installed with their stems or spindles above the horizontal.

b. Flow Control Valve. - Flow control valves shall be installed in the supply mains near the boiler. The valve shall operate so that when the circulating pump starts the increased pressure within the main will open the valve and when the pump stops the valve will close. The valves shall be constructed with a cast iron body, and shall be provided with a device whereby the valve may be opened manually to allow gravity circulation. The flow control valve shall be designed for the intended purpose, and shall be installed as recommended by the manufacturer.

c. Motor-Operated Valve. - A motor-operated globe valve shall be installed as indicated on the drawings. The valve shall be of the 2-position type with the valve body constructed of high tensile iron. The inner valve shall have renewable composition discs and V-ported guides. The stem shall be flexibly connected to the inner valve to reduce friction on the stem, and to permit positive seating of the inner valve without binding. The stem packing shall be spring loaded. The valve body shall be designed for static pressure of 125 p.s.i. gage and the electric motor shall have ample power to operate the valve.

d. Air Vents. - Air vents including fittings to permit transfer of air from the boiler to the expansion tank shall be installed as shown on the drawings or as directed by the Contracting Officer. An overflow pipe from the vent shall be run to a point designated by the Contracting Officer. The inlet to the air vent shall be provided with a gate valve.

36-22. BOILER COVERING. - The boiler, if unjacketed, shall be covered with magnesia, glass fiber or rockwool insulation at least 1-1/2 inches thick. Insulation shall be applied over 1-1/2 inch wire mesh, held away from the metal surfaces by metal spacers providing an air space of not less than 1 inch. Joints in the insulation shall be filled with magnesia, mineral-wool, or other equally suitable cement. Insulation shall be covered with heavy galvanized hexagonal wire netting and two coats of asbestos cement each approximately 1/4-inch thick. The first coat shall be left with rough surface and allowed to dry before the second coat is applied. The second coat shall consist of two parts by weight of asbestos cement and one part of portland cement, troweled on to a smooth, hard, uniform surface and neatly finished. Cleanout and access openings shall not be insulated, but the insulation and external plaster shall be neatly beveled up to the edge of such openings.

36-23. PIPE COVERING. - All heating-system piping shall be insulated with pipe covering. Pipe covering shall be of standard-thickness magnesia or vermiculite, or thermally equivalent thickness of mineral wool, calcium silicate, cellular glass, asbestos, or other approved noncombustible insulation. Covering shall be held in place with metal strips not less than 3/4-inch wide. Strips shall be spaced to hold the center and ends of each section, and in no case shall the spacing exceed 18 inches. Valves and fittings, except unions and flanges, shall be covered with magnesia cement or mineral-wood cement of the same thickness as the pipe covering. All pipe covering and plastic insulation shall be protected by means of cotton sheeting, weighing not less than 3.5 ounces per yard of 37-1/2 inch width, pasted neatly over the material. Aluminum straps shall not be used for securing sectional pipe covering containing alkaline substances unless the aluminum surface is adequately protected against corrosion.

36-24. ELECTRICAL WORK. - All manual or automatic control and protective or signal devices required for the operation of the heating equipment herein specified and any wiring required but not indicated on the electrical plans shall be furnished and installed under this section of the specifications. Wiring shall conform to ELECTRICAL WORK, INTERIOR. A complete electrical-connection diagram for each piece of mechanical equipment having more than one automatic or manual electrical-control device shall be submitted to the Contracting Officer for approval.

36-25. PAINTING AND FINISHING. - All uncoated ferrous-metal work such as pipe supports and uninsulated piping in areas having unpainted adjacent surfaces shall be thoroughly cleaned and given one coat of asphalt varnish. All other uncoated ferrous-metal work shall be primed and finish painted as specified in Section, PAINTING.

36-26. OPERATION AND MAINTENANCE INSTRUCTIONS. - Operation and maintenance instructions, in printed form, glass-enclosed and framed, covering each item of equipment shall be posted at locations designated by the Contracting Officer. Upon completion of the work, and at a time designated by the Contracting Officer, the services of a competent engineer shall be provided for a period of not less than 1 day to instruct a representative of the Government in the operation and maintenance of the heating system.

36-27. TESTS. - Before any covering is installed, the entire system, including boiler, radiators, unit heaters, and fittings, shall be hydrostatically tested and proved tight under a pressure of 45 p.s.i. gage. Upon completion and prior to acceptance of the installation, the contractor shall subject the heating system to such operating tests as may be required by the Contracting Officer to demonstrate satisfactory functional and operating efficiency. Operating tests shall cover a period of 8 hours for each system, and shall include the following specific information in a report, together with conclusions as to the adequacy of each system.

a. Time, date, and duration of test.

b. Outside and inside dry-bulb temperatures.

c. Water pressure at boiler.

d. Water supply temperature leaving boiler.

e. Water return temperature from system at boiler inlet.

f. Boiler make, type, serial number, design pressure, and rated capacity.

g. Oil-burner make, model, and rated capacity, and ammeter and voltmeter readings for oil-burner motors.

h. Water-circulating-pump make, model, and rated capacity, and ammeter and voltmeter readings for pump motor during operation.

i. Temperature and pressure of fuel oil at burner.

j. Grade of fuel oil used.

k. Fuel-gas temperature at boiler outlet.

l. Percent CO_2 in flue gas.

m. Quantity of hot water circulated.

49

All indicating instruments shall be read at half-hour intervals unless otherwise directed by the Contracting Officer. The report of the test shall be supplied in quadruplicate to the Contracting Officer. The contractor shall furnish all instruments, test equipment, and test personnel that are required for the tests, and the Government will furnish the necessary fuel, water, and electricity.

36-28. CLEANING OF BOILERS AND PIPING. - After the hydrostatic tests have been made and prior to the operating tests, the boilers and piping shall be thoroughly cleaned by filling the system with a solution consisting of either 1 pound of caustic soda or 3 pounds of trisodium phosphate per 100 gallons of water. The water shall be heated to approximately 150 degrees F. and the solution circulated in the system for a period of 48 hours, then drained, and the system thoroughly flushed out with fresh water.

36-29. OPTIONAL CONTROLS. - Pneumatic controls or electronic controls may be provided in lieu of electrical controls.

a. Pneumatic Controls. - Where pneumatic controls are furnished, an air compressor of the standard piston type, complete with tank, valves, gages, filters, and other necessary appurtenances shall be provided. Air lines shall consist of suitable tubing with airtight fittings. The air compressor and tank shall be located as directed by the Contracting Officer. The pneumatic control system shall conform to American Standard B19.

36-30. GUARANTY. - The following equipment to be furnished under this section of the specifications shall be guaranteed as specified in the guaranty paragraph of the SPECIAL CONDITIONS.

Boiler.
Oil-burning equipment.
Automatic-heat-regulating equipment.
Pressure-regulating and relief valves.
Pressure gage and thermometer.
Circulating pump.
Unit heater.

36-31. PAYMENT. - No separate payment will be made for the work covered under this section, and all costs in connection therewith shall be included in the applicable lump-sum contract prices for the structures to which the work pertains.

SECTION 37

WATER SUPPLY WELLS
(Item 99)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
37-01	Scope	37-1
37-02	Applicable Federal Specifications	37-1
37-03	General	37-1
	a. Exploratory Borings	37-1
37-04	Casings	37-1
37-05	Drilling and Testing Wells	37-1
	a. Driving 8-Inch Casing	37-2
	b. Drilling 8-Inch Well	37-2
	c. Installing 6-Inch Casing	37-2
	d. Six-Inch Drilling	37-2
	e. Testing for Plumbness and Alignment	37-2
	f. Pumping and Drawdown Tests	37-3
37-06	Precautions to be Taken	37-4
37-07	Water Analysis	37-5
	a. Form of Analysis	37-5
	b. Sample	37-5
	c. Information With Samples	37-6
37-08	Sterilization	37-6
37-09	Cleaning Up	37-6
37-10	Measurement and Payment	37-6

SECTION 37

WATER SUPPLY WELLS
(Item 99)

37-01. SCOPE. - The work covered by this specification consists of furnishing all labor, tools, equipment, utilities, and materials, and performing all operations for the drilling and testing of deep wells at the locations indicated on the drawings, furnishing chemical and bacteriological analysis of water, complete, in strict accordance with this section of the specifications and the applicable drawings.

37-02. APPLICABLE FEDERAL SPECIFICATIONS. - The following Federal Specifications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

WW-P-406a.	Pipe, Steel (Seamless and Welded for Ordinary Uses Iron Pipe Size).
WW-P-441b & Am-1.	Pipe; Wrought Iron (Welded Black or Zinc Coated).

37-03. GENERAL. - It is the intent of this specification that the contractor shall drill a well or wells at the Utility Building and at the Operator's Quarters, as required, to produce a satisfactory potable water supply with a minimum yield of 5 gallons per minute when pumped continuously for 24 hours daily. Wells shall be drilled at the locations shown on the drawings. If the first well at each site does not furnish the required yield, additional well or wells at locations selected by the Contracting Officer shall be drilled. Payment for additional well or wells will be made at the contract unit prices bid for the first well, except that suitable adjustment will be made for mobilization and demobilization items.

a. Exploratory Borings. - Exploratory borings have been made by the Government in the general vicinity of the selected locations of the wells. The location of these borings and the classification of materials encountered are shown on appropriate sheets of the contract plans.

37-04. CASINGS. - The well casings shall be new standard weight wrought iron piping conforming to the applicable requirements of Federal Specification WW-P-441, Class A, except as noted in paragraph 37-05c. Joints in casing pipe shall be welded.

37-05. DRILLING AND TESTING WELLS. - Each well shall be drilled to an approximate depth of 250 feet below the natural surface of the ground; however, if authorized in writing, the well shall be extended

to a depth greater than 250 feet but not exceeding 400 feet. A separate payment will be made for this additional work, see Paragraph 37-01e. The right is reserved to stop drilling or testing at any time the Contracting Officer determines that the supply of water is satisfactory or that the yield will be insufficient.

a. Driving 8-Inch Casing. - An 8-inch casing (nominal diameter) shall be driven through overburden and into the bedrock as far as possible, but not more than one foot. At the Utility Building no overburden shall be encountered and at the contractors option the 8-inch casing can be omitted.

b. Drilling 8-Inch Well. - Inside this casing, an 8-inch well shall be drilled approximately 10 feet into the rock.

c. Installing 6-Inch Casing. - A 6-inch casing (nominal diameter) extending from the bottom of the 8-inch well to an elevation 6-inches above ground surface shall be centered within the 8-inch casing and well. The space between the 6-inch casing and rock or 8-inch casing shall be filled with a thin, rich grout to the top of the 8-inch casing. The grout shall be made of quick-setting cement and clean sand and shall be allowed to set for 24 hours before drilling is resumed. The top of the 6-inch casing shall be threaded and a suitable cap shall be supplied and installed. The 8-inch outer casing may be withdrawn at the option of the contractor after placing the grout. If the contractor elects to withdraw the 8-inch casing, standard weight steel pipe, conforming to Federal Specification WW-P-406, may be used instead of wrought iron. If the outer casing is to be left in place, it shall be wrought iron.

d. Six-Inch Drilling. - A 6-inch well shall be drilled below the 8-inch casing a sufficient depth to obtain a satisfactory yield of water. A detailed log of the progress of the drilling of the well shall be kept by the contractor and delivered to the Contracting Officer upon completion of the well drilling operations.

e. Testing for Plumbness and Alignment. - The well shall be constructed, and the casing set, round, plumb, and true to line. To demonstrate the compliance of his work with this requirement, the contractor shall make the tests described herein. Tests for plumbness and alignment shall be made after the complete construction of the well and before its acceptance and in the presence of the Contracting Officer. Additional tests, however, may be made by the contractor during the performance of the drilling. Plumbness and alignment shall be tested by lowering into the well to a depth of 10 feet below the lowest point at which a pump would be set, depending upon the level at which water is found and the probable drawdown, a section of pipe 40 feet long or a dummy of the same length. The outer diameter of the pipe or dummy shall be not more than 1/2-inch smaller than the diameter of that part of the well being tested. If a dummy is used, it shall consist of a rigid spindle with 3 rings, each ring being 12-inches long, and truly cylindrical. The rings shall be spaced, one at each end of the dummy and one in the middle. The central member of the dummy shall be rigid so that it will maintain the alignment of the axis of the rings. Should the test pipe or dummy fail to move freely throughout the length of the

casing or well to the above-specified depth, or should the well vary from the vertical in excess of two-thirds the smallest inside diameter of that part of the well being tested per 100-foot depth, or beyond the limitations of this test, the plumbness and alignment of the well shall be corrected by the contractor, and should he fail to correct such faulty alignment or plumbness, the Contracting Officer may refuse to accept the well. The Contracting Officer may waive the requirements of this paragraph as regards plumbness, if in his judgment (a) the contractor has exercised all possible care in constructing the well, and the defect is due to circumstances beyond his control; (b) the utility of the completed well will not be materially affected.

f. Pumping and Drawdown Tests. - If it is necessary, in the opinion of the Contracting Officer, to determine the approximate yield, the well shall be tested by bailing or pumping daily during the drilling period. It is desired to obtain a safe total minimum yield as specified in Paragraph 37-03. When the daily test indicates either that a suitable supply has been obtained or that a sufficient depth has been reached, the well shall be carefully tested for yield and drawdown as specified below. The well shall be tested by pumping continuously for a period of not less than 2 days. During this period, the contractor shall make observations of the drawdown and yield. Samples shall be taken by the contractor for analysis. During the pumping period, the contractor shall keep a complete and detailed log of all observations made and notes as to weather conditions, periods of shutdown, and other pertinent facts. On completion of the test, this pumping log shall be delivered to the Contracting Officer.

(1) Test pumping equipment shall have a maximum capacity of approximately 50 gpm. The pump shall be suitable for deep well pumping. The pump and drive shall be of sturdy construction, reliable in operation and capable of pumping continuously for the duration of the test, except for such brief interruptions as may be required for adjustment, oiling, or fueling. The pump discharge shall have a suitable sampling cock and means for throttling the discharge if desired. Provision shall be made for discharge of water by pipeline at an approved point away from the well, where it will not return to the well. On the day before commencement of the pumping test, the pump and drive shall be given a thorough check-up to insure reliable operation and shall be operated continuously for a period of at least two hours and for such additional time as is needed to determine that the equipment is properly installed and in satisfactory working order. The rate of flow shall be carefully determined by a calibrated end orifice, or by volumetric measurement in an approved manner; if determined by an orifice, the approach conditions shall be suitable. In all cases, adequate means shall be provided for accurate measurement of the head. The depth to water surface shall be accurately measured by means of an electrical contact

device or by the installation of drawdown tubing and air pressure measurement with a calibrated gage.

(2) The test for the well shall be conducted in the following manner.

(a) The static water level shall be noted before pumping is commenced.

(b) The well shall be pumped at a rate of approximately 5 gpm. for six hours, during which time observations shall be made every half hour of the pumping rate and the depth to the water surface in the well.

(c) The well shall be further pumped continuously, for a period of six hours at the rate of 10 gpm. during which time observations shall be made every half hour of the pumping rate and the depth to the water surface in the well.

(d) The pumping rate shall be increased as directed until the maximum yield of the well has been obtained and shall be pumped at the uniform rate as directed and continuously for 48 hours. During this period, observations shall be made every hour of the rate of pumping and depth to the water surface in the well.

(e) Following completion of the pumping period, the contractor shall make observations of the depth to water surface at 15-minute intervals for two hours and then hourly until the water level becomes practically static.

(3) Interruptions required for adjustment of equipment or for minor repairs shall be held to a minimum and shall not total more than 5 percent of the entire test period. If shutdowns or interruptions due to the failure of the contractor's organization or equipment exceed the above-defined limits, and tests are declared a failure for these reasons, the contractor shall perform a new pumping test.

37-06. PRECAUTIONS TO BE TAKEN. - The contractor shall take such precautions as are necessary or as may be required permanently to prevent contaminated water, gasoline or other foreign matter from entering the well either through the opening or by seepage through the ground surface. In the event that the well becomes contaminated or that water having undesirable physical or chemical characteristics does enter the well due to the neglect of the contractor, he shall perform such work or supply such casings, seals, sterilizing agents, or other material as may be necessary to eliminate the contamination or shut off undesirable water.

37-07. WATER ANALYSIS. - After tests have been made concerning the adequacy of the source of water from each well, the contractor shall secure a representative sample of the well water (approximately one gallon) for the chemical analysis and approximately 8 oz. for the bacteriological analysis, and have a complete chemical and bacteriological analysis made by a publicly owned or commercial laboratory sufficiently experienced in performing water analyses to insure reliable results.

a. Form of Analysis. - For purposes of comparison and standardization, the analysis shall be reported in the following form.

Water Analysis

PH Value _____
Total Solids _____ Parts per million
Calcium as Ca _____
Magnesium as Mg _____
Sodium and Potassium as Na _____
Iron as Fe _____
Silicon as SiO2 _____
Sulphates as SO4 _____
Chlorides as CL _____
Nitrates as NO3 _____
Alkalinity (Methyl Orante) as CaCO3 _____
(Phenolthalein) as CaCO3 _____
Total Hardness as CaCO3 _____ Parts per million
Carbonate Hardness As CaCO3 _____
Non-Carbonate Hardness as CaCO3 _____
Free Carbon Dioxide as CO2 _____
Salt _____
Hydrogen-Sulfide _____

b. Sample. - The representative one gallon water sample may be transported in one or more clean glass containers for analysis. The samples shall be labeled with name and location of and identification number of well, date of collection, and name of contractor. The laboratory shall be provided with, in addition to a gallon sample, a small sample (four to eight ounces) for bacteriological analysis. Care shall be taken to see that sample bottles are thoroughly cleaned and the smaller bottle sterilized. A small air space shall be left in the filled bottle to allow for expansion. Samples when collected from well shall be representative of the water in the underground formation and not that which has stood in contact with the well casing or pump. The well pump shall be operated 10 minutes or longer before collecting the samples.

c. Information With Samples. - The following information shall be forwarded with the water samples properly identified with respect to the samples.

(1) Location of well, including county and state, together with distance and direction of nearest town.

(2) Date well was drilled.

(3) Depth and diameter of well and length of casing.

(4) Yield in gallons per minute.

(5) Distances to water level in well, both while idle and while being pumped.

(6) Date and temperature of water when sample was collected.

(7) Description as to the appearance of any suspended matter and color.

(8) Any other information that the laboratory performing the analysis may require.

37-08. STERILIZATION. - The well shall be sterilized prior to acceptance. The disinfecting agent shall be Calcium Hypochlorite or Chlorinated Lime conforming to the requirements of Federal Specification O-C-114a. The quantity of disinfecting agent added to the well shall be sufficient to provide a chlorine residual of 50 parts per million. Following a minimum contact period of 8 hours, the chlorinated water shall be pumped from the well until the chlorine residual is less than 0.2 parts per million. During the contact period, a sufficient ampunt of the chlorinated water shall be pumped and returned to the well to insure that the walls of the casing have been thoroughly flushed.

37-09. CLEANING UP. - On completion of the work, the contractor shall remove his materials and equipment except as required in subparagraph 37-05f above, clean up debris, and leave the site substantially in the condition in which it was found.

37-10. MEASUREMENT AND PAYMENT. - a. Payment for mobilization of the contractor's equipment and personnel will be made at the applicable contract lump sum prices for "Mobilization and Demobilization for Water Supply Well", which prices shall include all costs in connection with procurement and assembly at the site of the work of all plant,

equipment, materials, supplies, and labor required for the prosecution of the work and, upon completion of the work as specified and directed, the cleanup of the work areas, removal of plant, equipment, materials, and supplies from the site of the work.

b. The quantity to be paid for under "Driving 8-Inch Outer Casing" will be the number of linear feet of casing measured from the lower end to the ground surface. Payment will be made at the contract unit price for "Driving 8-Inch Outer Casing" and shall include furnishing and driving the casing and the removal of all materials from the interior thereof down to the surface of the rock.

c. The quantity to be paid for under "Drilling 8-Inch Hole Below 8-Inch Casing" will be the number of linear feet of 8-inch well drilled below the surface of the rock. Payment will be made at the contract unit price for "Drilling 8-Inch Hole Below 8-Inch Casing", and shall include all operations performed in connection with this drilling.

d. The quantity to be paid for under "Setting 6-Inch Inner Casing" will be the actual number of linear feet of 6-inch casing installed. Payment will be made at the contract unit price for "Setting 6-Inch Inner Casing", and shall include furnishing, setting, and grouting the casing in place, including the furnishing of grouting materials.

e. The quantity to be paid for under "Drilling 6-Inch Hole, Uncased", will be the actual number of linear feet of hole so drilled measured from the bottom of the 8-inch hole. Payment will be made at the contract unit price for "Drilling 6-Inch Hole, Uncased", and shall include the performance of all operations in connection with this drilling. In case the contractor is directed to extend the well to a depth greater than 250 feet below ground surface grade, the actual number of linear feet of hole so drilled below the 250-foot level will be measured and paid for under "Drilling 6-Inch Hole, Uncased, Below Depth of 250-Feet". This payment shall include all costs in connection with the drilling operations below 250 feet in depth.

f. The quantity to be paid for under "Test-Pumping Well", will be the actual number of hours of test-pumping measured from beginning to end of the approved pumping period, except that shutdowns of more than one (1) hour, inefficient pumping time, or tests declared a failure, all as determined by the Contracting Officer, will be deducted from the gross time. Payment will be made at the contract price per hour for "Test-Pumping Well", and shall include the performance of all operations in connection with test-pumping, including sterilization and taking samples and securing analyses as specified. Preliminary testing of the pump and calibrating equipment will not be measured for payment.

SECTION 38

WATER AND SEWER SYSTEMS
(Items 100 through 103, incl.)
(Index)

Paragraph No.	Paragraph Title	Page No.
38-01	Scope	38-1
38-02	Excavation, Trenching and Backfilling	38-1
38-03	Water Supply Wells	38-1
38-04	Applicable Specifications	38-1
	a. Federal Specifications	38-1
	b. American Water Works Association Std.	38-2
38-05	Well Chamber	38-2
38-06	Installation of Well Piping	38-3
	a. Drop Piping	38-3
	b. Piping from Well Chamber to Pumps	38-3
	c. Copper Tubing	38-3
	d. Vent Piping	38-3
38-07	Valves	38-3
38-08	Water Storage Tanks	38-3
	a. General	38-3
	b. Gravel Bedding	38-3
	c. Material	38-4
	d. Painting	38-4
	e. Subdrain and Filter Material	38-4
38-09	Well Pumps	38-4
38-10	Sterilization	38-5
38-11	Leaching Trench System	38-5
	a. Distribution Pipe	38-5
	b. Filter Material	38-6
	c. Installation	38-6
38-12	Sewer Lines	38-6
	a. Materials	38-6
	b. Installation	38-6
	c. Joints	38-7

Paragraph No.	Paragraph Title	Page No.
38-13	Septic Tanks	38-7
38-14	Vents and Cleanout	38-8
38-15	Cleanup	38-8
38-16	Payment	38-8

SECTION 38

WATER AND SEWER SYSTEMS
(Items 100 through 103, incl.)

38-01. SCOPE. - The work covered by this section consists of furnishing all plant, labor, materials and equipment, and performing all operations in connection with the installation of the water supply and sanitary sewer systems, at the Operator's Quarters and the Utility Building complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

38-02. EXCAVATION, TRENCHING AND BACKFILLING. - Excavation, trenching and backfilling shall conform to applicable requirements of Section 32.

38-03. WATER SUPPLY WELLS. - Wells are specified and included under Section 37.

38-04. APPLICABLE SPECIFICATIONS. - The following specifications and standards, of the issues listed below but referred to thereafter by basic designation only, form a part of this specification:

a. Federal Specifications. -

O-C-114a	Calcium Hypochlorite, Technical, and Chlorinated Lime, Technical.
O-S-602	Sodium Hypochlorite.
BB-C-120	Chlorine.
QQ-L-156	Lead, Calking.
WW-P-521c	Pipe - Fittings; Malleable Iron and Steel (Screwed) 150 Pound.
WW-P-441b	Pipe; Wrought Iron (Welded, Black or Zinc Coated).
WW-U-531a	Unions; Malleable Iron or Steel.
HH-P-117	Packing; Jute Twisted.
HH-P-119	Packing Material, Sewer Joint, Asphalt Saturated Cellulose-Fiber.
QQ-I-652a	Iron Castings, Gray.
QQ-L-156 & Am-1	Lead; Calking.
SS-B-656	Brick; Building (Common) Clay.
SS-C-192b	Cements, Portland.
SS-P-631b & Am-1	Pipe, Clay Sewer.
SS-P-331a	Pipe Asbestos-Cement, Sewer Non-Pressure.
SS-S-169	Sealer, Joint, Sewer Mineral-Filled, Hot-Pour.
WW-P-401 & Am-3	Pipe and Pipe-Fittings; Soil Cast Iron.

b. American Water Works Association Standard. -

C601-54 Disinfecting Water Mains.

38-05. WELL CHAMBER. - a. General. - The well chambers shall be constructed of brick, concrete or precast concrete rings with frost proof cast iron frame and covers, and in accordance with the drawings. The well chambers shall have cast iron steps of approved design or 7/8 inch diameter wrought iron rungs not less than 10 inches in width built into and thoroughly anchored in the walls and spaced uniformly 15 inches apart with alternate steps or rungs offset 6 inches.

b. Concrete used in the chambers shall conform to requirements of Section 14. Brick shall conform to Federal Specification SS-B-656, hard. Concrete rings shall conform to Federal Specification SS-P-375, except that the length of the sections may be shorter as conditions require, the wall thickness shall be not less than 4 inches for vertical wall sections and not less than 4-3/4 inches for cone sections, and shall be reinforced with not less than 0.12 square inch of steel per foot of wall height. Joints between precast rings shall be fully-bedded in cement mortar and shall be smoothed to a uniform surface on both the interior and exterior of the chamber.

c. Jointing and Plastering. - Mortar for jointing and plastering shall consist of 1 part portland cement and 2 parts fine sand. For brick work, lime may be added to the mortar in the amount of not more than 25 percent of the volume of cement. The joints shall be completely filled and shall be smooth and free from surplus mortar on the inside of the chamber. Brick chambers shall be plastered with 1/2 inch of mortar over the entire outside surface of the walls, and then given a priming coat of asphalt primer and a mop coat of asphalt. Brick shall be laid radially with every sixth course laid as a stretcher course.

d. Frames and Covers. - The frames and covers shall be cast iron of the frost proof design, the inner cover shall be cast iron. The frame and cover shall have a combined weight of not less than 400 pounds and shall conform to Federal Specification QQ-I-652. The letter "W" at least 2-inches high shall be stamped or cast into the covers, so as to be plainly visible. The frames and covers shall be set in a full cement mortar bed and the top of the cover shall be 3 inches higher than the finished or original ground.

e. Water-Level Testing Device, Gage and Valve. - A water-level testing device, consisting of a pipe or tube for insertion between the well casing and pump discharge column shall be provided in each well chamber installation. The pipe or tube shall extend to the bottom of the pump suction pipe, and, shall be tagged or otherwise marked to show its exact length. Each water level testing device shall be furnished with all necessary fittings, a pressure gage calibrated in feet, a check valve, and a hand-operated air pump with the necessary connections. The testing device shall enable measurement of the water level in the well under any condition.

38-06. INSTALLATION OF WELL PIPING. - a. Drop Piping. - The suction and pressure piping within the well casing shall be of wrought iron pipe with the jet setting 5 feet below the pumping level.

b. Piping from Well Chamber to Pumps. - The suction and pressure piping from well chamber to the pump in the heater room of the Utility Bldg. and the pump in the cellar of the Operator's Quarters shall be wrought iron and shall conform to Federal Specification WW-P-441, class A hot-dip zinc-coated, ends threaded and coupling on one end.

(1) Specials and fittings shall be galvanized malleable iron conforming to Federal Specification WW-P-521, type II.

(2) Coating. - Pipe and fittings shall be thoroughly cleaned of foreign matter by wire-brushing and solvent-cleaning, and then given one coat of coal-tar primer and two coats of coal-tar enamel conforming to Military Specification MIL-P-15147C. After installation and testing in final position, coatings where damaged shall be given a hot-applied touchup coat of the specified enamel.

c. Copper Tubing. - The option of copper tubing may be used in the piping from the well chamber to the pumps. Tubing shall conform to Federal Specification WW-T-799, type K annealed. Joints for underground work shall be compression-pattern, flared for soft copper water tubing and shall be made with fittings meeting approved standards. The tubing shall be cut off square and expanded with a proper flaring tool.

d. Vent Piping. - The vent piping from the well chambers to the buildings shall be wrought iron or copper tubing as specified above. The piping shall be securely attached to the buildings and to the heights noted on the Building Plumbing Drawings.

38-07. VALVES. - Gate valves shall be all brass and shall conform to Federal Specification WW-V-54, class B. Globe valves on the well piping pressure and suction lines at the pumps shall be brass and shall conform to Federal Specification WW-V-51A, type I, class B.

38-08. WATER STORAGE TANKS. - a. General. - The contractor shall furnish and install one (1) 10,000 gallon and one (1) 500 gallon buried water storage tank at the locations shown on the drawings. The tanks shall be buried level with earth cover of four (4) feet over the top of the tanks.

b. Gravel Bedding. - Gravel bedding shall be installed around the 10,000 gallon tank to the limits shown on the drawing. The gravel shall be natural sandy gravel or gravelly sand of the components passing the No. 4 U. S. Standard Sieve, not more than 5% by weight shall pass the No. 200 U. S. Standard Sieve. The material shall contain between 10 and 40% by dry weight of particles retained on the No. 4 U. S. Standard Sieve. No stones shall have a maximum dimension of greater than 4 inches.

c. Material. - The tanks shall be the horizontal steel type, welded construction and suitable for underground installation. The shell plates shall be at least 1/4-inch thick and the head plates at least 5/16-inch thick. Both tanks shall be furnished with an 18-inch diameter flanged manhole opening in the top, and with a 2-inch water tight fill pipe and box. The manhole opening on the 10,000 gallon tank shall have a hinged cover and lifting chain. A 36-inch diameter 1/4-inch thick steel access chamber with a metal checked plate cover. Access cover shall be furnished with a hasp and brass padlock.

d. Painting. - After cleaning the tanks the interior surface shall be given a coat of Bitumastic Tank Solution Paint or approved equal. The exterior surfaces shall be given a 1/4-inch thick coating of Bitumastic 70B Enamel conforming to MIL-P-15147C.

e. Subdrain and Filter Material. - In addition to the gravel bedding specified in Subparagraph b, the 10,000 gallon tank shall be provided with a 6-inch subgrade drain and filter material located as shown on the drawing. Subdrain pipe shall be constructed of full diameter standard strength bell and spigot perforated clay pipe. The outlet pipe from the filter material out to grade shall be nonperforated clay pipe. Material and installation shall conform to the paragraph "Sewer lines" of this section of the specifications, except perforations shall be as called for under ASTM Designation C211. The subdrain pipe shall be placed with the perforations down and laid in the pervious material to the dimensions noted on the drawing. Porous filter material around the subdrain shall be 3/4-inch concrete aggregate as specified under Section, CONCRETE.

38-09. WELL PUMPS. - a. The well pumps for the Utility Building and Operator's Quarters shall be of the jet type, two (2) pipe system capable of delivering 300 gallons per hour into a hydropneumatic tank set at 60 psig in the Utility Building and 40 psig in the Operator's Quarters. The pump shall be the centrifugal type with an all bronze impeller, and mechanical shaft seal. The contractor shall not submit a pump for approval until the well has been completed. Depth capacity and drawdown data for the well must be submitted with the pump. However, for bidding purposes the contractor shall base the contract price on a system at both sites with the foot valve located 150 feet below original ground and a maximum drawdown of 100 feet below original ground. Any increase in the cost resulting from changes of the pump setting after the well has been completed will be the subject of an equitable adjustment of the Contract commitment.

b. Motors. - Standard NEMA frame capacitor type jet pump motors, with solid shaft, ball bearing, totally enclosed fan cooled type suitable for operation on 3 phase 120/208 volt 60 cycle current in the Utility Building and single phase 120/240 volt 60 cycle current in the Operator's Quarters, shall be used to operate the well pumps. The motors shall have built-in overload protection.

c. Jet. - The jet shall have an all bronze body, a bronze nozzle and tube and shall have a bronze foot valve and strainer. Piping within the wells shall be wrought iron, piping from the well chambers to the pumps shall be wrought iron or copper tubing as specified herein for "Installation of Well Piping".

d. Well Cap. - A sanitary well cap shall be provided to support the vertical pipes in the well. An opening shall be provided in the well cap for the water level testing device specified herein for "Well Chamber".

e. Installation of Equipment. - The contractor shall install the above equipment as shown, or specified so the pumps will start when the pressure is 40 psig and stop when the pressure is 60 psig for the Utility Building and start when the pressure is 20 psig and stop when the pressure is 40 psig at the Operator's Quarters. After the installation has been completed the contractor shall apply a hydrostatic pressure of 75 pounds to the entire system from the well through the hydropneumatic tank for two (2) hours duration. During the test the contractor shall measure the capacities at the available suction heads and the pressures on the suction and discharge side of the pumps and shall deliver all test data to the Contracting Officer.

38-10. STERILIZATION. - The pumps and the connecting lines thereto shall be thoroughly disinfected with chlorine before being placed in operation. The amount of chlorine applied shall be such as to provide a dosage of not less than 50 parts per million. The chlorinating material shall be introduced into the system, and allowed a contact period of not less than eight (8) hours, the heavily chlorinated water shall be flushed from the system with clean water until the residual chlorine content is not greater than two-tenths parts per million. All valves in water lines being disinfected shall be opened and closed several times during the 18 hour period. The contractor may use either of the following materials;

Calcium Hypochlorite and Chlorinated Lime conforming to requirements of Federal Specification O-C-114.

Sodium Hypochlorite conforming to requirements of Federal Specification O-S-602.

38-11. LEACHING TRENCH SYSTEM. - The leaching trench system shall be constructed in accordance with the details shown on the drawings. All work, including stripping and excavation, shall be performed in a manner to avoid intermixing the top layers of soil with the underlying materials and thus creating a more impervious base upon which the leaching trench will be constructed.

a. Distribution Pipe. - Distribution pipe in the leaching trenches is designed to spread the sewage over the area of the leaching trench. In order to accomplish this purpose, care must be exercised in

placing the pipe exactly as shown on the drawings. Leaching trenches shall be dug to the dimensions shown on the drawings, and with the sides of the trenches as nearly vertical as possible.

b. Filter Material. - Filter material shall be washed and screened gravel obtained from commercial source and shall be composed of hard, tough durable particles, free from adherent coating and shall not contain vegetable matter, nor soft, friable, thin or elongated particles. The gradation of the material shall meet with the approval of the Contracting Officer and shall be within the following gradation range:

U. S. Standard Sieve Size	Percent Passing by Weight
1"	100
3/4"	85-100
3/8"	70-80
No. 4	40-70
No. 10	20-50
No. 40	0-15
No. 65	0-5

c. Installation. - The six inch clay bell-and-spigot pipe shall be open joint pipe as called for on the drawings. Open joints shall be 3/8-inch held in alignment by approved wooden spacers left in place in the bell and shall have a piece of 30-pound roofing felt 4 inches wide laid over the top half of the joint. After backfilling trenches with filter material to the depths shown, the balance of the trench shall be backfilled with earth fill lightly tamped by hand.

38-12. SEWER LINES. - a. Materials. - The sewer lines from five feet outside the Utility Building and Operator's Quarters to the inlet of the septic tanks and from the outlet of the septic tanks to the beginning of the leaching trench systems shall be vitrified clay, bell-and-spigot pipe and fittings, standard strength deep and wide socket pipe conforming to Federal Specification SS-P-361b. All pipe will be inspected upon delivery and such as does not conform to the requirements of the contract shall be rejected and must be removed by the contractor. The contractor shall furnish all labor necessary to assist the inspector in inspecting the material. At the option of the contractor, asbestos cement pipe conforming to Federal Specification SS-P-331a, Class 1, may be used in lieu of clay pipe for sewer lines.

b. Installation. - Pipe of the required size shall be laid to conform to the lines and grades shown on the drawings or as established by the Contracting Officer. Each pipe shall be so laid as to form a close joint with the next adjoining pipe and bring the inverts continuously to the required grade. The bottoms of pipe trenches shall be shaped to give full support to the lower quadrant of each pipe, so that the pipes shall have a continuous and even bearing and equally distributed pressure

upon them. Suitable bell holes shall be dug about pipe bells to provide ample space for making tight joints. All bends and connections shall be made with commercially manufactured branches and fittings. Open ends of pipe and branches shall be sealed with vitrified clay stoppers secured in place in an acceptable manner using a suitable gasket between the stopper and the socket. In no case shall water be allowed to rise in or about the pipe before the joint has become thoroughly set. Walking on or working over the pipes after they are laid will not be permitted until they are covered with earth to a depth of 12 inches except as may be necessary in tamping the earth and backfilling. All openings to the pipe line shall be satisfactorily protected to prevent the entrance of earth or other material.

c. Joints. - Bell-and-spigot joints shall be made with bituminous joint compound unless otherwise specified. The compound shall be heated to the proper temperature to permit rapid pouring and to obtain a strong adhesion of the compound to the pipe. The temperature of the molten compound shall be between 350 degrees F. and 450 degrees F. unless otherwise recommended by the manufacturer. The pipe shall be centered so that the annular space is uniform. The annular space shall then be well calked with jute or oakum. The depth of the packing shall be such as to leave a space or at least one (1) inch measured from the end of the bell. When the jointing is made with the pipe in its final location a suitable joint runner, dipped into thick mud or grout to permit easy removal when the joint has cooled shall be placed around the pipe, leaving an opening at the top of the runner. The molten compound shall be poured continuously into the opening until the joint is filled and as rapidly as possible without entrapping air. After the compound has cooled, the runner may be removed. Alternate joints may be poured before the pipe is lowered, in which case the joint shall be poured with the pipe in vertical position without the use of the runner. The compound shall have thoroughly set before the pipe is placed in the trench and the pipe shall be handled without deforming the joint.

38-13. SEPTIC TANKS. - a. Material. - The septic tank for the Utility Building shall have a minimum working capacity of 1250 gallons, and for the Operator's Quarters a minimum working capacity of 800 gallons. Tank shall be fabricated of 12 gage steel and coated inside and out with a bituminous material applied hot as standard with the manufacturer. The tanks shall be of the horizontal type and be equipped with two (2) access manholes, a minimum of 16 inches in diameter over the inlet and outlet baffle plates. Access chimneys shall be secured to the tanks and extended up to grade and shall be provided with solid removable covers. The tanks shall be installed in a level position on a 12-inch gravel bedding as specified under water storage tanks. Shop drawings shall be submitted for approval.

b. Precast-reinforced concrete tanks may be used in lieu of the steel tanks. If this option is exercised the contractor shall submit detail drawings of the proposed tanks and shall receive approval of such drawings prior to start of work on this item. Concrete shall meet a 4000 p.s.i. test. Installation shall be as specified for steel tanks above.

38-14. VENTS AND CLEANOUT. - The cleanout shall be connected to the 6-inch V.C. sewer line by means of a 6" C.I. soil pipe wye branch and extended 6 in. above grade with 6" C.I. soil pipe. Vents on the leaching trench system shall be connected to the 6" V.C. pipe by means of a 6" C.I. soil pipe tee and extended to 6 in. above grade with 6" C.I. soil pipe. The bell of the open pipe above grade shall be fitted with a C.I. grate on the vent pipes and C.I. solid cover for the clean-out. Cast iron soil pipe shall conform to the applicable paragraph in the section on "Plumbing" and shall be extra heavy weight pipe.

38-15. CLEANUP. - Upon completion of the installation of the water and sewer systems, well chambers, water storage tanks and appurtenances, all debris and surplus materials resulting from the work shall be removed.

38-16. PAYMENT. - a. Payment for all work specified in this section (except otherwise specified) will be included in the following lump sum prices for the various features of work. The tank at the Flood Control Gate Shaft will be included for payment purposes under the lump sum price for Item No. 100, "Water Distribution System - Utility Building Area."

b. All work relative to water distribution systems including the well pumps, and piping thereto from the well chambers will be included in the applicable lump sum contract prices for Items Nos. 100 and 101, "Water Distribution System."

c. All work relative to the sewage disposal system, will be included in the applicable lump sum contract prices for Items Nos. 102 and 103, "Sewage Disposal System."

d. The vent pipe and the suction line from the 500 gallon tank to the gate shaft structure will be included under the lump sum contract price for Item 68, "Flood Control Gate Shaft - Miscellaneous."

e. The above lump sum contract prices shall include all costs in connection with excavation (except rock), filling and backfilling.

SECTION 40

PAINTING

(INDEX)

Paragraph No.	Paragraph Title	Page No.
40-01	General	40-1
	a. Scope	40-1
	b. Requirements	40-1
	c. Definitions and Nomenclature	40-1
	d. Standard Specifications	40-2
	e. Samples and Tests	40-2
	f. Payment	40-3
40-02	Cleaning and Preparation of Surfaces	40-3
	a. General	40-3
	b. Cleaning and Preparation of Ferrous Surfaces	40-3
	c. Cleaning of Galvanized Surfaces	40-5
	d. Wood Surfaces	40-5
	e. Surface Preparation of Plaster Surfaces	40-6
	f. Fabric Covering	40-6
40-03	Paint Application	40-7
	a. General	40-7
	b. Paint Properties, Labeling, Storage, Mixing, and Thinning	40-7
	c. Atmospheric Conditions	40-8
	d. Protection of Paint Surfaces	40-8
	e. Contacting Surfaces	40-9
	f. Time Between Surface Preparation and Painting	40-9
	g. Method of Paint Application	40-9
	h. Coating Progress	40-9
	i. Drying Time Prior to Immersion	40-10
	j. Coverage and Film Thickness	40-10
	k. Direction for Application of Vinyl Type Paints	40-10
40-04	Paints to be Applied - Number of Coats and Formulas	40-11
	a. General	40-11
	b. Painting Schedule (Exterior and Interior Surfaces	

Paragraph No.	Paragraph Title	Page No.
40-05	Special Paint Formulations Not Covered By Standard Specifications	40-21
	a. Exceptions	40-21
	b. General	40-21
	c. Inspection and Tests	40-21
	d. Packaging and Labeling	40-21
	e. Colors and Tints	40-21
	f. Paint Formulations	40-22
	g. Ingredient Materials	40-23

SECTION 40

PAINTING

40-01. GENERAL. - a. Scope. - (1) The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with preparation of surfaces, application of all paint or other materials, and the manufacture of paints, paint materials, and miscellaneous materials incidental thereto, (except as otherwise stated) complete in strict accordance with the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

(2) Surfaces to be painted shall receive the treatment and number of coats prescribed in the painting schedule.

b. Requirements. - No paint under this section will be applied to the following materials.

(1) Metal surfaces that are to be encased or embedded in concrete.

(2) Galvanized iron including wrought-iron railings and steel (except as specifically stated).

(3) Copper, brass, bronze, or plated work.

(4) Aluminum surfaces.

(5) Concrete surfaces.

(6) Factory finished items.

(7) Corrosion resisting steel.

(8) Items included to be painted under other sections.

c. Definitions and Nomenclature. - (1) Paint. - The term "paint" as used herein includes emulsions, enamels, paints, stains, varnishes, sealers, and other coatings, organic or inorganic, whether they be used as prime, intermediate, or finish coats. This definition does not include troweled or metal-sprayed coatings.

(2) Shop Painting. - The term "shop painting", as referred to herein and/or on the drawings, covers operations conducted on painting material or equipment in a shop or plant before shipment to the site of erection or installation.

(3) Field Painting. - The term "field painting", as referred to herein and/or on the drawings, covers the application of paint coats at the construction site.

(4) New surfaces refers to unpainted surfaces of newly fabricated structures and items which are to receive paint coats.

(5) Touch-up painting refers to the application of paint on small areas of painted surfaces to repair mars and scratches and to restore the coating to an unbroken condition.

(6) Repainting designates the cleaning and recoating of extensive areas on which the existing coatings have deteriorated or otherwise do not provide adequate surface protection.

(7) Blast cleaning designates the cleaning of surfaces by forceful impingement of abrasive particles thereon by air blast or centrifugal action and includes sandblasting and gritblasting.

d. Standard Specifications. - Materials specified herein to meet the requirements of standard specifications published by national authorities shall conform with the issue in effect on the date of invitation for bids. National authorities publishing standard specifications referred to herein with the abbreviations used are as follows.

Agency	Abbreviation
Office of Standardization, Dept. of Defense	MIL or JAN
General Service Administration	Fed. Spec.
American Society for Testing Materials	ASTM Spec.
American Waterworks Association	AWWA Spec.

e. Samples and Tests. - One-quart samples of each batch of each type and color of paint proposed for use shall be submitted to the Contracting Officer and approval thereof received before the material represented by the sample is used on the project. Where specifically indicated herein or where indicated in a Standard Specification for a finished paint product, separate samples of ingredient materials will be required. The ingredient samples when furnished shall be clearly identified by commercial name, trade designation, batch number and such other data as may be deemed necessary. Sampling at the paint factory under proper supervision will be permitted. In addition to furnishing samples, the contractor shall submit certified reports of tests thereof to the Contracting Officer, indicating compliance with the specifications.

f. Payment. - Payment for all work performed and for all materials furnished under this section of the specifications will be included in the contract prices for the items on which the work is performed, and to which the materials are applied.

40-02. CLEANING AND PREPARATION OF SURFACES. - a. General. - Surfaces to be painted shall be clean before applying paint or surface treatments. The removal of oil and grease shall, in general, be accomplished with mineral spirits or other low-toxicity solvents having a flash point above 100° F. before mechanical cleaning is started. Solvent cleaning shall be done with clean cloths and clean fluids to avoid leaving a thin film of greasy residue on the surfaces being cleaned. Where blast cleaning is used, minor amounts of grease and oil contaminants need not be removed with solvents provided the abrasive is not reclaimed and reused and provided the blast cleaning process, by itself, leaves the surfaces completely free of grease and oil. Cleaning and painting shall be so programmed that dust or other contaminants from the cleaning process do not fall on wet, newly painted surfaces. Surfaces not intended to be painted shall be suitably protected from the effects of cleaning and painting operations. Fabricated, assembled items which are normally cleaned and painted in the shop in accordance with the manufacturer's standard practice will be considered for exemption from the detailed cleaning and painting requirements set forth herein, upon specific request of the contractor. Machine-finished and other bare metal surfaces, which are not to be painted, but which will require temporary protection during construction, shall be treated with rust-preventive compound conforming to MIL Spec. MIL-C-16173A, Grade I, unless otherwise specifically indicated. Removable equipment adjacent to surfaces to be painted shall, if necessary, be disconnected and moved to permit cleaning and painting of said surfaces, and replaced by workmen skilled in the trades involved.

b. Cleaning and Preparation of Ferrous Surfaces. - (1) Surfaces in Exterior or Interior Atmospheric Exposure. - Ferrous surfaces which will be completely and continuously in normal exterior or interior atmospheric exposure (see schedule) shall be cleaned in the shop or place of manufacture. Grease, dirt, and other soiling substances shall be removed by means of emulsions, steam, solvents, and/or other approved methods. Rust and loose mill scale shall be removed by high-speed power brushing, scraping, chipping, disc-sanding, or other approved means. Preparation of surfaces by blasting to at least the degree of surface cleanliness indicated for the other methods of mechanical cleaning may be used at the option of the contractor. The use of chipping tools with action so severe as to produce cuts, burrs and other forms of excessive surface roughness will not be permitted. "Tight" mill scale, i.e., that which cannot be lifted by applying a sharp knife to any edge, will be permitted. Minor amounts of residual

rust, not removable except by thorough blast cleaning, will be permitted but stratified rust (scale) shall be removed in any event. Welds and adjacent surfaces to the extent affected by welding shall be given special treatment by scraping, chipping, and wire brushing to insure that flux, slag and weld spatter are removed. Following mechanical cleaning, the weld and adjacent surfaces shall be treated with a phosphoric acid solution conforming to Military Specification MIL-M-10578B, Type II, diluted in the proportion of 1 volume of base material to 4 parts of clean water. The diluted material shall be applied by brush or sponge and allowed to remain one-half minute or longer, followed by thorough wiping with clean wet rags. Surfaces shall be primed in the shop as soon as practicable after cleaning with the linseed oil type primer specified for atmospheric exposed steel. (See schedule). Weathering of fabricated, unpainted steel for any purpose will not be permitted unless the surfaces are subsequently to be blast cleaned of all mill scale and rust to base metal. Prior to applying subsequent coats, all welds and other damaged areas of shop-primed surfaces shall be field cleaned and reprimed as previously specified.

(2) Cleaning and Pretreatment of Ferrous Surfaces in Underwater Exposure. - Surfaces of structural components which will be subject to extended periods of immersion or otherwise as required (see schedule) shall be cleaned of all rust, mill scale and other foreign matter to base metal by dry blast cleaning. Blast cleaning shall be done in the field after erection unless specifically authorized otherwise by the Contracting Officer. Surfaces to be coated which will not be accessible after erection shall be cleaned and painted before becoming inaccessible. The cleaned surfaces shall be of a uniform gray-white metallic color, completely free of mill scale, rust, oxide, paint, welding slag, weld spatter or other foreign material. Where necessary, power tools shall be used in conjunction with blast cleaning to effect the removal of weld spatter and heavy, stratified rust scale. Blast cleaning shall be accomplished with sand, crushed iron or steel grit or synthetic nonmetallic grit of such particle shape, hardness and gradation as to effectively clean the metal and leave a roughened surface suitable for tenacious adhesion of subsequent coatings. The maximum particle size of any type of abrasive shall be no larger than that passing a No. 16 mesh screen, U. S. sieve series. Nonmetallic abrasives shall be dustfree and no more than 10% shall pass a No. 50 mesh sieve. The contractor shall take all precautions to prevent damage to machinery and surfaces not requiring blast cleaning and to prevent dust from settling into any adjacent films of wet paint. As soon after cleaning as practicable and prior to the formation of any detectable condensation or corrosion, all blast-cleaned ferrous surfaces shall be cleaned of dust and abrasive particles by brushing, vacuum and/or blow-down with clean, dry compressed air, and given the first coat of paint including any pretreatment, required by the schedule. In no event, shall blast-cleaned surfaces stand

overnight without having received the specified pretreatment and/or the first coat of paint prescribed by the schedule. Structural features or components, such as which make up a single integral surface and which are subject in part to atmospheric exposure and in part to immersion in water, shall be prepared and painted as though the entire component were subject to immersion. Surfaces requiring complete removal of mill scale shall be cleaned in the field, except that upon written request by the contractor, the Contracting Officer may authorize mill or shop cleaning of assembled or partially assembled components specified to receive a vinyl type paint system. The surfaces, if shop-cleaned, shall be blasted, pretreated if required, and coated with the paint specified in the schedule for the first coat. The dry film thickness of the shop-applied coating shall be 2.0 to 2.5 mils, irrespective of the number of passes or coats required to achieve this thickness. This pre-erection or construction period coating shall be maintained in good condition by recleaning and touching up any areas damaged during the construction period. Prior to the field application of subsequent coats to obtain the prescribed total film thickness, soiled areas of the pre-erection coating shall be thoroughly cleaned with mineral spirits and all welds or other unpainted or damaged areas shall be cleaned and primed in such a manner as to make them equivalent to adjacent, undamaged paint surfaces.

c. Cleaning of Galvanized Surfaces. - Unless otherwise specifically provided, galvanized surfaces shall not be painted. Where such surfaces are specified to be painted, they shall be first washed with clean mineral spirits and then coated by spray, swab or brush with vinyl type wash coat conforming to MIL Spec. MIL-P-15328B (see specific directions for application of vinyl type coatings) preparatory to receiving the specified paint coats.

d. Wood Surfaces. - (1) Wood surfaces, except surfaces to be given natural finish, shall be primed and finish-coated as specified in the painting schedule herein. Open grained woods to be painted, such as oak or mahogany, shall be treated with wood filler prior to priming and prepared for painting as hereinafter specified. Wood surfaces to be painted shall be cleaned of all dirt, oil, or other foreign substances with mineral spirits, scrapers, sandpaper, and/or wirebrush. Finished surfaces exposed to view shall be made smooth by sandpapering. All exterior woodwork, including millwork, exterior siding, and wood members that will be in contact with masonry, shall be given a coat of the specified first-coat material on all sides and edges before installation. The built-in surfaces of window sills shall be double-primed. Glazing rabbets and beads in exterior sash and doors shall be double-primed prior to glazing. Parting strips of wood double-hung windows shall be treated with two coats of boiled linseed oil. Edges of doors that

have been trimmed during hanging and fitting shall be given a coat of the specified first-coat material. Small, dry, seasoned knots shall be surface scraped and thoroughly cleaned, and shall be given a thin coat of knot sealer conforming to Military Specification MIL-S-12935 before application of the priming coat. Pitch on large, open, unseasoned knots and all other beads or streaks of pitch shall be scraped off, or if still soft, shall be removed with mineral spirits or turpentine and the resinous area thinly coated with knot sealer. After priming, all holes and imperfections in finish surfaces shall be filled with putty or plastic wood-filler colored to match the finish coat, allowed to dry, and sandpapered smooth. Unless otherwise authorized, painting shall proceed only when the moisture content of the wood does not exceed 12 percent as measured by a moisture meter. Painting of exterior wood siding shall proceed, insofar as is practicable, only after interior masonry work has dried.

(2) Interior wood surfaces to receive natural finish, except as hereinafter specified, shall be stained to the approved shade and lightly sanded. Oak and other open-grain wood shall be given the same treatment and, in addition, shall be given a coat of paste wood filler not less than 8 hours after the application of stain. Excess filler shall be removed and the surface then sanded smooth. Each varnish coat shall be lightly sanded prior to application of subsequent coat.

(3) Interior wood floors shall be well sanded with a power sanding machine before finishing, working in the direction of the grain of the wood as far as possible. No. 3 sandpaper shall be used for the first rough sanding followed by No. 1-1/2-sandpaper and finally by No. 0 sandpaper. No traffic will be permitted on the floor between the last sanding and application of the finish. Oak and similar open-grained woods shall be filled with wood filler and all excess filler removed. Each coat of sealer applied to floors shall be power buffed with fine steel wool to remove raised grain and excess sealer. Final coat of sealer shall be allowed to dry one week before waxing.

e. Surface Preparation of Plaster Surfaces. - Prior to painting, care shall be taken to insure that plaster surfaces are thoroughly dry and clean and free from grit, loose plaster, and surface irregularities. Cracks and holes shall be repaired with approved patching materials, properly keyed to the existing surfaces and sandpapered smooth. Plaster shall be permitted to age the minimum number of days prescribed in the schedule before application of the first coat of paint.

f. Fabric Covering. - Fabric covering over insulation on pipes, ducts, and other equipment shall be given a heavy coat of

nonpenetrating size to which subsequent paint coats will permanently adhere. The size shall be applied in such manner as to completely seal the surface. A sufficient amount of fungicidal agent shall be added to the size and each finish coat of paint thereafter to render the fabric mildewproof. The fungicidal agent shall be of a type that will not adversely affect the color, texture, or durability of the paint or size. One percent of one of the phenol mercuric compounds or 4 percent tetrachlorophenol is acceptable for oil-base materials. Four percent sodium tetrachlorophenate is acceptable for water-emulsion paints and sizes. Percentages are based on the nonvolatile vehicle content of the paint.

40-03. PAINT APPLICATION. - a. General. - All work shall be done in a workmanlike manner, so that the finished coating will be free from holidays, pinholes, bubbles, runs, drops, ridges, waves, laps, unnecessary brush marks and variations in color, texture, and gloss. All coats shall be applied in such manner as to produce an even film of uniform thickness. Edges, corners, crevices, seams, joints, welds, rivets, and other surface irregularities shall receive special attention to insure that they receive an adequate thickness of paint. Care shall be exercised during spraying to hold the nozzle perpendicular to and sufficiently close to the surfaces being painted to avoid loss of material into the air, or the bridging over of crevices and corners. Spray equipment shall be equipped with traps, separators, mechanical agitators, pressure gages and pressure regulators. Aircaps, nozzles, and needles shall be as recommended by the spray equipment manufacturer for the material being applied. Spray painting shall be supplemented by brushing or other means where necessary to properly coat crevices, pockets, interior angles and all other surfaces which cannot be satisfactorily coated by spray. Respirators shall be worn by all persons engaged or assisting in spray painting.

b. Paint Properties, Labeling, Storage, Mixing, and Thinning. - All paint, when applied, shall provide a satisfactory film and a smooth, even surface. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints shall be thoroughly stirred, strained and kept at a uniform consistency during application. Paste pigments, specified to be added at the time of use, shall be mixed as follows: place the pigment in a separate container and add small increments of the required vehicle or base paint, with thorough stirring, until a viscous, smooth, homogeneous lump-free mixture is obtained. Mix in the remainder of the vehicle or base paint by boxing and stirring. Powdered metallic pigments, added at the time of use, shall be mixed by adding the powder in small increments to about one-third of the required base paint or vehicle, with thorough mixing to obtain a smooth mixture. The remainder of the vehicle or base paint shall then be thoroughly stirred in. Where necessary, in the opinion of the inspector, to suit conditions of surface, temperature,

weather, and method of application, the packaged paint may be thinned immediately prior to use by the addition of not more than one pint per gallon of the proper thinner provided that in no case shall the paint be reduced more than is absolutely necessary to obtain the proper application characteristics. Vinyl paints may be thinned more than the maximum indicated above (see specific directions for applying vinyl type paints). Paint shall be delivered to the job in unbroken containers which shall show the designated name, formula, or specification number, color, batch number, any special directions, manufacturer and date of manufacture, all of which shall be plainly legible at the time of use. Paints which can be harmed by exposure to cold weather shall be stored in heated shelters. During application, the paint in the spray tank or other working container shall be not less than 50° F.

c. Atmospheric Conditions. - Except as specified or required for certain water-thinned paints, paints shall be applied only to surfaces which are completely free of moisture as determined by sight or touch. In no case shall any paint be applied to surfaces upon which there is visible frost or ice. While painting is being done, the temperature of the surfaces to be painted and of atmosphere in contact therewith, shall be maintained at or above 45° F., except that in no event shall latex type (water-thinned) paints be applied at air and surface temperatures which are low enough to detrimentally affect the formation and character of the dried film. Where paints are being used which dry solely by evaporation of organic solvent, such as the vinyl type paints, the temperature of air and surface may be 35° F., or as approved by the Contracting Officer. During periods of inclement weather, painting may be continued by inclosing the surfaces with temporary shelters and applying artificial heat, provided the minimum air, surface, and paint temperatures prescribed above are maintained. Paint shall not be applied to surfaces which are hot enough to cause blistering or pinholing of the film.

d. Protection of Paint Surfaces. - Where shelter and/or heat are provided for paint surfaces during inclement weather, such protective measures shall be maintained until the paint film has dried, and/or discontinuance of the measures is authorized. Items which have been painted shall not be handled, worked on or otherwise disturbed until the paint coat is completely dry and hard. After delivery at the site of permanent erection or installation, all shop-coated metalwork shall be stored out of contact with the ground in such a manner as will minimize the formation of water-holding pockets and in such a location as will minimize soiling, contamination and deterioration of the paint film. Shop-coated metal shall be repainted or retouched from time to time with the specified paint, whenever in the opinion of the Contracting Officer it becomes necessary to maintain the integrity of the film.

e. Contacting Surfaces. - When riveted or bolted contact is to exist between surfaces of ferrous or other metal parts of substantially similar chemical composition, such surfaces will not be required to be painted. Contacting surfaces formed by high-strength bolt connections shall not be painted. Where an electrical potential is apt to exist between metal surfaces of unlike chemical composition in riveted or bolted contact, each of the contacting surfaces shall be cleaned, pretreated, and given one coat of primer, all as specified for the particular metals involved. Where a nonmetal surface is to be in riveted or bolted contact with a metal surface, the contacting surfaces of the metal shall be cleaned, pretreated if required, and given three coats of the specified primer.

f. Time Between Surface Preparation and Painting. - Surfaces which have been cleaned and/or otherwise prepared for painting shall be primed as soon as practicable after such preparation has been completed, but in any event, prior to any deterioration of the prepared surface.

g. Method of Paint Application. - Unless otherwise specifically directed or authorized by the Contracting Officer, the first coat on surfaces of plaster, or other nonmetallic items shall be applied by brush or roller provided that the latter method, in the opinion of the Contracting Officer, furnishes a coating equal to brush application in appearance, uniformity and other respects. Subsequent coats may be applied by roller, spray, or brush. The specified first coat of paint shall be applied by brush to ferrous surfaces which have not been blast-cleaned but may be applied by spray or brush, except as otherwise specified, to surfaces which have been blast-cleaned. All subsequent coats for all ferrous surfaces may, unless otherwise specified, be either brush or spray applied. All coats for nonferrous metal surfaces may be brushed or sprayed. Whenever spraying of a surface is permitted or directed, it is to be understood that all areas inaccessible to spray painting shall be coated by brushing or other suitable means.

h. Coating Progress. - Where field painting on any type of surface has commenced on any portion of the work, the complete painting operation, including priming and finishing coats, on that portion of the work, shall be completed as soon as practicable, without prolonged delays. Sufficient time shall elapse between successive coats to permit them to dry properly for recoating and this minimum drying period shall be modified as necessary to suit adverse weather conditions. Paint shall be considered dry for recoating when it feels firm and does not deform or feel sticky under moderate pressure of the finger. The application of another coat of paint shall not cause such film irregularities as lifting or loss of adhesion of the undercoat and the undercoat shall have

dried sufficiently so as not to retard the drying of the next coat. At all times prior to final acceptance of the work, all coats of all painted surfaces shall be unscarred and completely integral at the time of application of all succeeding coats. At the time of application of each successive coat, undercoats shall be cleaned of dust, grease, or any foreign matter, which might adversely affect intercoat adhesion, by means of air blast, solvent cleaning or other approved means. Enamel undercoats of high gloss shall be scuff-sanded prior to application of a succeeding coat. Field coats on metal shall be applied after erection except as otherwise specified and excepting surfaces to be painted which will become inaccessible after erection.

i. Drying Time Prior to Immersion. - Vinyl type paint systems shall be allowed a final dry as long as practicable, but painted surfaces shall not be immersed in water with less than 72 hours drying of the last coat.

j. Coverage and Film Thickness. - The actual surface area covered per gallon of paint shall not exceed the spreading rates prescribed in the schedule. Where no spreading rate is specified, the paint shall be applied at a rate normal for the type of material being used. In any event, the combined coats of a specified paint system shall completely hide the base surface. Where dry film thickness requirements are specified for ferrous surfaces, the measurements shall be made with a General Electric, Type B, film thickness gage, calibrated on metal identical in composition, thickness, and surface preparation to the item being coated. Sufficient measurements shall be made to accurately establish average thicknesses.

k. Direction for Application of Vinyl Type Paints. - (1) Vinyl Type Wash Coat (conforming to MIL Spec. MIL-P-15328B) shall be mixed by adding 1 volume of acid component (diluent) to 4 volumes of resin component (base solution). The acid component shall be added slowly and with constant stirring. After mixing, the wash coat shall be used within 8 hours and any mixed material older than 8 hours shall be disposed of or removed from the job. The wash coat shall be spray applied at a coverage rate of 250 to 300 square feet per gallon of resin component to give a dry film thickness of 0.3 to 0.5 mils. Small areas may be wash-coated by brush or swab. Care shall be exercised in spray application to avoid the deposition of dry particles on the surface. A wet spray shall be maintained at all times by additional thinning with Normal Butanol or 99 percent Isopropanol where required by prevailing weather conditions. The acid component (diluent), over and above the amount prescribed above, shall not be used for thinning purposes. Surfaces treated with the wash coat shall receive the first coat of paint after at least one hour of drying for the wash coat, and within 24 hours after the wash coat treatment.

(2) Vinyl paints other than the vinyl type wash coat shall be spray applied, except that minor areas inaccessible to spraying shall be brushed. The vinyl paint as received shall be thinned 20 to 35 percent by volume, with T-10 thinner (90 percent toluene and 10 percent methyl isobutyl ketone). The use of other thinners will not be allowed. The amount of thinner shall be varied to suit prevailing weather conditions but shall at all times be sufficient to provide a wet spray and avoid deposition of particles which are dry when they strike the surface. Each coat required by the schedule shall consist of a preliminary , extra spray pass on edges, corners, interior angles, seams, crevices, junctions of joining members, rivet lines, weld lines and similar surface irregularities, followed by an over-all double spray coat, applied at a coverage rate of approximately 130 square feet per gallon of unthinned paint but in any event, sufficient to obtain an average dry film thickness of 1.25 to 1.75 mils. Where impracticable, because of weather conditions or other reasons, to obtain this film thickness, additional applications, at no additional cost to the Government, shall be made so that the prescribed film thickness for each type of paint used in the system is obtained. A double spray coat shall consist of giving a sizeable area of several hundred square feet a fairly thin coat of paint in one pass and then going over it again in a few minutes with a heavy, wet coat, applied just short of sagging in order to build up the prescribed film thickness. Particular care shall be exercised to insure that the spray nozzle is held close enough to the surface to avoid excessive loss of volatile material in the spraying process. The spray nozzle shall, at all times, be perpendicular to the surface being coated. Rivets and similar surface projections shall receive sprayed paint from every direction in order to insure complete coverage of all faces. Pits, cracks, and crevices shall be filled with paint insofar as practicable. Fluid and atomization pressure shall be kept as low as practicable consistent with good spraying results. Alternate passes of the spray shall be at right angles to the preceding pass. Hot spray application of vinyl type paints, except vinyl wash coat, will be permitted. Undercoats shall be permitted to dry at least two hours before recoating, but not more than 2 double spray coats shall be applied in one 8-hour day. Where vinyl paints are used in enclosed spaces, an adequate ventilating system shall be provided, plans for which shall be approved by the Contracting Officer.

40-04. PAINTS TO BE APPLIED - NUMBER OF COATS AND FORMULAS. - a. General. - The surface preparation and paints required for various types of surface and exposure are shown in subparagraph b, below. Supplementary information for use with the schedule follows.

(1) Fabricated and assembled items which are normally painted in accordance with the manufacturer's standard practice except

ferrous surfaces subject to immersion and abrasion in water may be exempted from the following schedule requirements for surface preparation and painting, on specific request by the contractor and approval by the Contracting Officer. Mars and scratches on surfaces painted in accordance with the manufacturer's standard practice shall be touched-up in the field to provide an appearance satisfactory to the Contracting Officer.

(2) Colors and Tints shall match the respective color specimens designated by, or shall otherwise be subject to the approval of the Contracting Officer. Where so directed by the Contracting Officer, alternate coats of paints having the same color shall be tinted with small amounts of ultramarine blue or lamp black or other approved ingredients, ground in a vehicle compatible with the paint being tinted, in order to insure that all surfaces are properly coated with the specified number of paint coats. Tinting of vinyl type paints shall be done only by the manufacturer. Unless otherwise specified, the color of undercoats shall match the color of the finish paint as nearly as practicable.

(3) The method of surface preparation and pretreatment shown in the schedule is for identification purposes only. Cleaning and pretreatment of surfaces prior to painting shall be accomplished in accordance with detailed requirements hereinbefore described.

(4) The designated titles of Federal and other standard specifications, which are identified by symbol or abbreviated name elsewhere in this specification, are as follows.

Federal Specifications:

TT-A-468.	Aluminum-Pigment; Powder and Paste for Paint.
TT-B-846.	Butyl Alcohol; Normal (for use in organic coatings).
TT-C-120.	Carbon-black; Dry (Paint-Pigment).
TT-E-489b.	Enamel; Gloss, Synthetic (for exterior and interior surfaces).
TT-E-506c.	Enamel, Tints and White, Gloss, Interior.
TT-E-508.	Enamel; Interior, Semi-gloss, Tints and White.

TT-E-543.	Enamel-undercoat, Interior, Tints and White.
TT-M-268.	Methyl Isobutyl Ketone (for use in organic coatings).
TT-P-29.	Paint, Latex Base, Interior, Flat, White and Tints.
TT-P-56b.	Primer Coating (Primer-Sealer), Pigmented Oil, Plaster and Wallboard.
TT-P-61b.	Paint; Ready-mixed, Black.
TT-P-81c.	Paint; Ready-mixed, Exterior Medium Shades on a Lead-Zinc Base.
TT-P-86a.	Paint; Red-lead base, Ready-mixed.
TT-P-102.	Paint (Titanium-lead-zinc, and oil, exterior, ready-mixed, white and light tints).
TT-P-375.	Pigment, Indian Red and Bright Red (iron oxide), Dry (for use in protective coatings).
TT-P-641b.	Primer, Paint; Zinc Dust-zinc Oxide (for galvanized surfaces).
TT-T-291a.	Thinner; Paint, Volatile Mineral Spirits (petroleum-spirits).
TT-T-306.	Thinner; Synthetic-enamel.
TT-T-425a.	Titanium-dioxide; Dry (Paint Pigment).
TT-T-548a.	Toluol (for use in organic coatings).
TT-T-656a.	Tricresyl Phosphate.
TT-V-119.	Varnish; Spar, Phenolic-resin.
Fed. Standard 141.	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing.
595.	Colors.

Military Specifications:

MIL-M-10578B.	Metal Conditioner and Rust Remover (Phosphoric Acid Base).
MIL-P-15328B.	Primer, Pretreatment (Formula No. 117 for Metals).
MIL-C-16173A.	Corrosion Preventive, Solvent Cut-Back, Cold-Application.

(5) Special formulations indicated in the schedule which are not covered by Federal or other nationally recognized standard specifications are shown in paragraph 40-05.

b. Painting Schedule (Exterior and Interior Surfaces). -

(1) Exterior Ferrous Surfaces Subject to Atmospheric Exposure.

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior ferrous surfaces subject only to normal atmospheric exposure, not otherwise specified.	Solvent cleaning and wire brush (or equivalent); no pretreatment.	Fed.Spec. TT-P-86a Type I.	P-9	P-9	None
Main entrance doors Water Supply Intake Tower and Flood Control Gate Shaft Structures.	Manufacturers Standard.	Mfrs.Std.	Fed.Spec. TT-E-489b (Class A)	Fed.Spec. TT-E-489b (Class A)	None

Directions and Remarks

In the above system, the first coat shall be brush applied in the shop at a maximum spreading rate of 600 square feet per gallon and touched up as required in the field. The second and third coats shall be applied in the field at a maximum spreading rate of 500 square feet per gallon. Exterior ferrous surfaces shall include all structural steel exposed to the atmosphere except that inclosed within weathertight structures.

(2) Ferrous Surfaces Subject to Immersion and Abrasion in Fresh Water. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied: 1st Double Spray Coat	2nd Double Spray Coat	3rd Double Spray Coat	4th Double Spray Coat	5th Double Spray Coat
Surfaces of ferrous components subject to immersion in waters including gates and gate guides, conduit levers, air vent transition and piping, float well intakes, and cast iron water supply pipe.	Blast clean only (no pretreatment).	Vinyl V-766 (gray)	Vinyl V-766 (white)	Vinyl V-766 (gray)	Vinyl V-766 (white)	Vinyl V-766 (gray)

Directions and Remarks

The above vinyl system(s) shall be spray applied to an average dry film thickness of at least 7.5 mils for the completed system and the minimum thickness at any point shall be not less than 6.0 mils. The number of coats indicated above is intended as a guide only and may not furnish the required film thickness under certain weather conditions or with operators unfamiliar with the vinyl paints. The specified total film thickness shall be attained in any event and any additional coats needed to do so shall be applied at no additional cost to the Government. Entire surfaces of the designated item shall be cleaned and painted as though subject to immersion even though part of the surface will be only in atmospheric exposure. Alternate shades of paint specified for the system shall be furnished by the manufacturer; tinting of vinyl paints in the field will not be permitted. See specific directions for applying vinyl type paints.

(3) Ferrous Surfaces Subject to High Temperatures. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied: 1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior or interior metal surfaces subject to high temperatures as follows: Exhaust Piping from Generator Engine.	Solvent cleaning and wire brush (no pretreatment).	Two Coats Bitumastic Hi-Heat Gray Koppers Co., Inc., or approved equal.			

(4) Exterior and Interior Galvanized Metal Surfaces.

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior and interior galvanized metal surfaces, as follows: (a) All interior galvanized surfaces, operating floor and basement, Flood Control Gate Shaft, and operating floor, Water Supply Intake Tower. (b) All exterior galvanized surfaces Gate Shafts, Operating House and Water Supply Intake Tower.	Wash with solvents and apply vinyl type wash coat MIL spec. MIL-P-15328B.	TT-P-641b (Type II)	TT-E-489b (Class A)	TT-E-489b (Class A)	

(5) Interior Ferrous Surfaces. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Interior ferrous surfaces, not otherwise specified.	Solvent cleaning and wire brush. No pretreatment.	Fed.Spec. TT-P-86a (Type I).	Fed.Spec. TT-E-489b (Class A).	None	None
Entrance Doors-Structure.	-	As specified for exterior.			
Gasoline-Electric Generator set.	-	Manufacturer's Standard 1st and 2nd coats.		Fed.Spec. TT-E-489b (Class A).	None
Fuel Storage Tank within Buildings	-	TT-P-86a (Type I).	P-9	P-9	

Directions and Remarks

First coat shall be brush applied in the shop and its integrity maintained at all times by periodic touch-up painting in the field. Structural steel and miscellaneous ferrous surfaces in finished spaces shall, in lieu of the specified second coat, be finish-painted to match adjacent painted surfaces.

(6) Interior Radiators, Ducts, Pipes, etc., in Finished Spaces. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Interior radiators, ducts, conduit, tubing, pipes, fabric-covered insulated pipes, and similar miscellaneous items in finished and painted spaces.	Remove foreign matter. Wire brush as required.	Prime as required for applicable surfaces.	Number of coats, type of finish paint and color to match adjacent surfaces.		

Directions and Remarks

Color to match adjacent wall or ceiling surfaces. Fabric cover on insulated pipe shall be thoroughly sized before painting as hereinbefore specified.

(7) Ferrous Pipe, Pipe Hangers, Conduit, Tubing, etc. (Nongalvanized) in Unfinished Spaces. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Ferrous pipe, hangers, conduit, etc. (nongalvanized), in unfinished spaces of Flood Control Gate Shaft and Water Supply Intake Tower.	Remove foreign matter. Wire-brush as required.	TT-P-86a (Type II)	TT-E-489b (Class A)	TT-E-489b (Class A)	None

Directions and Remarks

Finish color to match adjacent painted machinery or as directed by the Contracting Officer.

(8) Interior Walls and Ceilings (Operator's Quarters and Utility Buildings).

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Interior gypsum wallboard walls and ceilings.		Fed.Spec. TT-P-29 (Type I)	Fed.Spec. TT-P-29 (Type I)	None	None
Interior plaster walls and ceilings.	As previously specified.	TT-P-56b.	TT-E-543.	TT-E-506.	

Directions and Remarks

Allow new plaster surfaces to dry and age at least 30 days before painting. Uncoated nails or other exposed ferrous metal on surfaces to be painted shall be spot-primed with an approved metal primer.

(9) Exterior Woodwork. -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Exterior woodwork on buildings not otherwise specified.	Solvent cleaning, scraping, sandpapering as required.	Fed.Spec. TT-P-25a.	Fed.Spec. TT-P-102.	Same as 2nd.	-
Shingles	Prestained with Fed.Spec.TT-S-706. (color as selected by Contracting Officer)	One thin field coat to match original stain.			
Vertical groove plywood siding.		Fed.Spec. TT-S-706.	Fed.Spec. TT-S-706.	None	

Directions and Remarks

All millwork required to be painted shall be primed on all sides prior to installation. At least 3 days but not more than 4 shall be allowed between coats, in good drying weather. Runs of window frames and all edges of sash and doors shall be given two thin coats of spar varnish, Fed. Spec. TT-V-121c after painting. All plywood edges shall be sealed with a heavy coat of TT-P-25a.

(10) Interior Wood Surfaces (Painted). -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Interior wood surfaces, except for floors and except as otherwise specified.*					
Cellar Stair, Operator's Quarters.		Two coats boiled linseed oil.			

*In Operator's Quarters basement, except for stairs and doors including frames and trim, no painting of wood surfaces is required.

Directions and Remarks

Finish color as directed. Undercoats shall approximate the color of the finish coat. The first coat of TT-E-543 shall be thinned with one pint of mineral spirits or turpentine per gallon of base paint.

(11) Interior Wood Floors (Natural). -

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Interior Wood Floors Operator's Quarters (except when tile or linoleum is to be installed).	Clean, sandpaper and fill as required.	Fed.Spec. TT-S-176b.	Fed.Spec. TT-S-176b.	Fed.Spec. P-W-155.	-

Directions and Remarks

Floors shall be sanded. Oak and similar open grain woods shall be filled with Fed. Spec. TT-F-336b wood filler prior to application of sealer, and all excess filler removed. Sealer shall be class 1 or 2 as required by type of flooring. Each application of sealer shall be followed by wiping and buffing operations to give a high quality finish prior to waxing.

(12) Operator's Quarters - Interior Wood Surfaces (Natural).

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Kitchen cabinets, living room planter box wall	Clean and sandpaper as required, stain with TT-S-711a, fill and seal as necessary.	Fed.Spec. TT-V-121c.	Fed.Spec. TT-V-121c.	Fed.Spec. TT-V-121c.	-

Directions and Remarks

Each coat of varnish shall be allowed to dry overnight and lightly sanded and then wiped clean prior to application of next coat. Final coat to have satin finish.

(14) Machinery, Interior and Exterior, Atmospheric Exposure.

Surface	Surface Preparation and Pretreatment	Paint Formulas to be Applied 1st Coat	2nd Coat	3rd Coat	4th Coat
Machinery in interior or exterior atmospheric exposure, not otherwise specified.	Solvent Cleaning and wire brush	Fed.Spec. TT-P-86a (Type II)	Fed.Spec. TT-E-489b (Class A)	Fed.Spec. TT-E-489b (Class A)	None

Directions and Remarks

In lieu of the specified system, machinery may be coated in accordance with the manufacturer's standard practice, when specifically approved by the Contracting Officer. In either event, finish coats shall be of color as selected by the Contracting Officer.

Machine-finished surfaces shall be protected during the construction period with rust preventive compound conforming to MIL Spec. MIL-C-16173A, Grade I, unless otherwise specifically indicated.

40-05. SPECIAL PAINT FORMULATIONS NOT COVERED BY STANDARD SPECIFICATIONS. - a. Exceptions. - The provisions and raw materials specified in this section are applicable only to the special paint formulations shown hereinafter in detail and not to those finished product coatings governed by Federal or other Standard Specifications.

b. General. - Paints shall have the composition as indicated in the formulas listed herein. Except where otherwise specified or authorized, all paint shall be made by grinding together dry pigments and a liquid vehicle to form a smooth paint that will flow freely and will not settle or react deleteriously in containers. Where so specified, special pigments shall be packaged in separate containers for mixing on the job. Unless otherwise specified, grinding shall produce a fineness such that coarse particles and skins will not exceed 1.5 percent (total residue left on No. 325 screen) based on pigment. All paints shall be so processed as to insure that within a period of one year from date of manufacture, they will not gel, liver or thicken deleteriously, or form gas in the closed container.

c. Inspection and Tests. - Inspection and tests, except as otherwise indicated, will be performed in accordance with the applicable provisions of the latest current revision of Federal Standard 141, entitled "Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling and Testing".

d. Packaging and Labeling. - Paints and vehicles shall be packaged in standard containers not larger than 5 gallons in size, with removable friction or lug-type covers. Containers for vinyl type paints shall be lined with a coating resistant to the solvents in the formulations and capable of effectively isolating the paint from contact with the metal in the container. Containers for phenolic aluminum paint shall be of the double-compartment type with the pigment compartment suspended inside the main container in such a manner that the pigment is isolated from contact with the vehicle. Each container shall be clearly and durably labeled to indicate the purchaser's order number, date of manufacture, manufacturer's batch number, quantity and full name and color of the material. Pigmented paints shall be packaged in containers not larger than 5 gallons.

e. Colors and Tints. - Colors where specified shall conform to the listed chip on latest revision of Fed. Standard 595 "Colors". If not specified, the color shall be that naturally obtained from the required pigmentation.

f. Paint Formulations. - (1) Formula P-9; Aluminum Paint, Linseed-Tung Oil, Phenolic Varnish.

Ingredients	Gallons	Pounds	% by Wt.
Finish aluminum paste	14.1	172.0	21.0
Varnish (Fed. Spec. TT-V-119)	85.9	649.5	79.0
	100.0	821.5	100.0

Aluminum pigment shall be packaged separately for Formula P-9 and mixed with vehicle immediately prior to use. Each vehicle container shall be labeled to the latter effect together with instructions showing correct proportions of vehicle and aluminum pigment. The mixed paint shall dry through, suitable for recoating, in 12 hours. Samples of Formula P-9 being submitted for approval shall include separate samples of aluminum pigment, varnish and the phenolic resin and oils used in the manufacture of the varnish.

(4) Formula V-766; Vinyl Type White (or Gray) Paint. -

Ingredient	Parts by Weight
Vinyl Resin Type 3	8.7
Vinyl Resin Type 4	8.7
Titanium Dioxide (Type III) and tinting pigments	13.3
Tricresyl Phosphate Plasticizer	3.3
Toluene	23.1
Methyl Isobutyl Ketone	42.85
Propylene Oxide	0.05
	100.00

The dispersion of pigment for Formula V-766 shall be accomplished by means of pebble mills or other approved methods. Grinding of this formulation in steel lined or steel ball mills will not be permitted. No grinding aids, antisettling agents or any other materials except those shown in the formula will be permitted. A 1.5 mil (dry) film of the paint, spray applied to a clean, cold-rolled steel panel and dried 48 hours, shall exhibit excellent adhesion. The fineness of grind (Fed. Standard 141, Method 4411) shall be not less than 7. Unless otherwise directed, half of the V-766 paint shall be furnished as white and the remaining half gray, the latter obtained by thoroughly dispersing carbon black into the formulation. The gray color shall approximate Color No. 26231 of Federal Standard 595. Samples of Formula V-766 submitted for approval shall include separate samples of all ingredient materials.

g. Ingredient Materials. - (1) Aluminum powder shall conform to Fed. Spec. TT-A-468, "Aluminum-Pigment; Powder and Paste, for Paint", Type I, Class B.

(2) Synthetic iron oxide (red) shall conform to Fed. Spec. TT-P-375 for "Pigment, Indian Red and Bright Red (Iron Oxide), Dry (for use in protective coatings)", Type I or II. Additionally, the pigment shall have a maximum oil absorption of 24, and a specific gravity of 4.90 to 5.20 in accordance with Fed. Standard 141, Methods 4191 and 4181. When the pigment is dispersed into the specified vinyl paint formulation, the paint shall show no evidence of incompatibility or reaction between pigment and resin after 6 months storage. Pigment shade shall be as required to produce the finished paint color.

(3) Titanium dioxide shall conform to Fed. Spec. TT-T-425a for "Titanium Dioxide; Dry (Paint-Pigment)", Type III, chalk-resisting, silicon-aluminum-zinc treated (rutile).

(4) Carbon black shall conform to Fed. Spec. TT-C-120 for "Carbon Black; Dry (Paint-Pigment)", Form I or II, Class B.

(5) Tricresyl phosphate plasticizer shall conform to Fed. Spec. TT-T-656a, entitled "Tricresyl Phosphate".

(6) Vinyl Resin, Type 3, shall be a vinyl chloride-acetate copolymer of medium average molecular weight and shall contain 85 to 88 percent vinyl chloride and 12 to 15 percent vinyl acetate by weight. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to "Vinylite" resin VYHH as manufactured by the Bakelite Company.

(7) Vinyl resin, type 4, shall be a copolymer of the vinyl chloride-acetate type, shall contain (by weight) 1 percent interpolymerized dibasic acid, 84 to 87 percent vinyl chloride and 12 to 15 percent vinyl acetate. The resin shall have film-forming properties and shall, in the specified formulations, produce results equal to "Vinylite" resin, VMCH, as manufactured by the Bakelite Company.

(8) Mineral spirits shall conform to Fed. Spec. TT-T-291, "Thinner; Paint Volatile Mineral Spirits (Petroleum Spirits", Grade I.)

(9) Toluene shall conform to Fed. Spec. TT-T-548a, "Toluol (for Use in Organic Coatings)".

(10) Butanol shall conform to Fed. Spec. TT-B-846, "Butyl Alcohol; Normal (for Use in Organic Coatings)".

(11) Methyl isobutyl ketone (MIBK) shall conform to Fed. Spec. TT-M-268, "Methyl Isobutyl Ketone (for Use in Organic Coatings)".

(12) Thinner T-10 for Vinyl Coatings shall consist of 10 percent methyl isobutyl ketone (by weight) and 90 percent toluene.

(13) Propylene oxide shall be a commercially pure product suitable for the intended use.

SECTION 41

BITUMINOUS CONCRETE PAVEMENT
(Item 94)

(Index)

Paragraph No.	Paragraph Title	Page No.
41-01	Scope	41-1
41-02	Description	41-1
	a. Asphalt	41-1
	b. Rate of Application	41-1
	c. Certified Analysis	41-1
	d. Weather Limitations	41-1
	e. Curing	41-1
41-04	Bituminous Concrete Pavement	41-1
	a. Testing and Approval	41-1
	b. Compaction of Mixture	41-2
41-05	Measurement and Payment	41-2

SECTION 41

BITUMINOUS CONCRETE PAVEMENT
(Item 94)

41-01. SCOPE. - This section covers bituminous concrete pavement treatment, including prime coat, complete.

41-02. DESCRIPTION. - The bituminous concrete pavements shall be constructed on a primed road gravel base. The 2 1/2-inch pavement shall be constructed in 2 courses consisting of a 1 1/2-inch bottom course and a 1-inch top course.

41-03. PRIME COAT. - a. Asphalt. - Bituminous material for the prime coat shall conform to Federal Specification SS-A-671a(1), designation MC-0 or MC-1.

b. Rate of Application. - Prime coat shall be applied at the rate of approximately 0.40 gallons per square yard of base course. The exact quantity, which may be varied to suit field conditions will be determined by the Contracting Officer. The bituminous material shall be applied at a temperature within the range of 70 - 140 F. for MC-0 and 110 - 185 F. for MC-1.

c. Certified Analysis. - The source from which the bituminous material is to be obtained shall be selected before the material is required for use in the work and a copy of the certified analysis representative of the material to be employed in the work, shall be submitted for approval not less than 15 working days before commencing work.

d. Weather Limitations. - Prime coat shall be applied only when the atmospheric temperature has not been below 35 degrees for 12 hours, immediately prior to application.

e. Curing. - Following the application of prime material, the surface shall be allowed to dry without being disturbed for a period of not less than 48 hours, or longer as may be necessary to attain penetration into the base and evaporation of the volatiles from prime material.

41-04. BITUMINOUS CONCRETE PAVEMENT. - Bituminous binder and surface courses shall conform to Standard Top and Bottom Courses in Section B-18, Class I, Bituminous Concrete Pavement, Type I - 1 of the Standard Specifications for Highways and Bridges, Commonwealth of Massachusetts, Department of Public Works, revised April 1961, with the following modifications:

a. Testing and Approval. - Suitably sized samples of the bituminous binder and surface course mixes proposed for use in the work, together with the proposed job-mix formula conforming to the requirements of the Commonwealth of Massachusetts standard specifications, shall be submitted for testing and approval to the Contracting Officer by the contractor

not less than 15 days prior to the time of contemplated use in the work. The approximate quantities of materials to be submitted are as follows:

Binder course mix	25 pounds
Surface course mix	25 pounds

The contractor will be notified, in writing, within 15 days after receipt of satisfactory mixes relative to the approval of the proposed job mix formulas.

b. Compaction of Mixture. - Rolling of both the surface course and binder course shall be continued until all roller marks are eliminated and a density of at least 95 percent of the calculated density of a voidless mixture composed of the same materials in like proportion.

41-05. MEASUREMENT AND PAYMENT. - Bituminous concrete road surfacing will be measured by the square yard of actual area installed. Bituminous concrete road surfacing will be paid for at the contract unit price per square yard for Item No. 94, "Bituminous Concrete Surfacing", which price shall constitute full compensation for all costs in connection with the furnishing of all equipment, supplies, and materials and in performing the the work specified in this section, including prime coat.

SECTION 42

BITUMINOUS SURFACE TREATMENT
(ITEM 95)

(INDEX)

Paragraph No.	Paragraph Title	Page No.
42-01	Scope	42-1
42-02	Applicable Publications	42-1
	a. Federal Specification	42-1
	b. American Society for Testing Materials Serial Designation	42-1
	c. American Association of State Highway Officials Standard Method	42-1
42-03	Description	42-1
42-04	Materials	42-2
42-05	Sampling and Testing	42-3
42-06	Quantities of Materials Per Square Yard	42-3
42-07	Equipment	42-4
	a. Bituminous Distributor	42-4
	b. Heating Equipment	42-5
	c. Power Rollers	42-5
	d. Mechanical Spreaders	42-5
	e. Broom Drags	42-5
	f. Power Brooms and Power Blowers	42-5
	g. Rubber-Tired Rollers	42-5
	h. Scales	42-6
42-08	Weather Limitations	42-6
42-09	Conditioning of Base Course	42-6
42-10	Preparation of Surface	42-6
42-11	Application of Bituminous Prime Coat Materials	42-6

Paragraph No.	Paragraph Title	Page No.
42-12	First Application of Bituminous Material for Double Surface Treatment	42-7
42-13	First Spreading of Aggregate	42-7
42-14	Brooming and Rolling First Course	42-7
42-15	Second Application of Bituminous Material	42-8
42-16	Second Spreading of Aggregate	42-8
42-17	Brooming and Rolling Second Course	42-8
42-18	Payment	42-8

SECTION 42

BITUMINOUS SURFACE TREATMENT
(ITEM 95)

42-01. SCOPE. - This section covers all operations in connection with the construction of bituminous surface treatment consisting of a prime coat and a double bituminous surface treatment on road gravel base, complete.

42-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specification. -

SS-A-671a.	Asphalt; Cut-Back (for) Road-Work.

b. American Society for Testing Materials Serial Designations. -

C 29-60.	Standard Method of Test for Unit Weight of Aggregate.
C 131-55.	Standard Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine.
C 136-39.	Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
D 75-59.	Methods of Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials
D 140-55.	Standard Methods of Sampling Bituminous Material.

c. American Association of State Highway Officials Standard Method. -

T 102-42.	Standard Method of Spot Test of Asphaltic Materials.

42-03. DESCRIPTION. - The bituminous prime coat covered herein shall consist of an application of hot bituminous material on a previously prepared road gravel base. The double bituminous surface treatment for primed base courses shall consist of a first application

of bitumen covered with mineral aggregate properly compacted, followed by a second application of bitumen covered with mineral aggregate and rolled to a smooth surface presenting an even texture.

42-04. MATERIALS. - a. The bituminous material used for the prime coat shall be cutback asphalt and shall conform to the requirements of Federal Specification SS-A-671, designation MC-0 or MC-1, with the additional requirements that the residue from distillation to 680 degrees F. shall show a negative spot when submitted to AASHO Standard Method T 102, using standard naphtha specified in Paragraph 3 thereof. Application temperatures shall be as follows:

MC-0.	50-120 degrees F.
MC-1	80-125 degrees F.

b. The materials used in the application of the double bituminous surface treatment shall be mineral aggregate and bituminous material, of the following types, gradations, grades, and consistencies:

(1) Mineral Aggregate. - Mineral aggregate shall consist of crushed stone or crushed gravel, free from adherent films of clay, and shall be of such nature that a thorough coating of the bituminous material used in the work will not strip off upon contact with water. The moisture content of the aggregate shall not be sufficient to prevent it from being readily coated with the bituminous material. Drying may be required as directed by the Contracting Officer. Aggregates shall have a percentage of wear not exceeding 40 after 500 revolutions, as determined by ASTM Serial Designation C 131.

(a) Crushed Stone. - Crushed stone shall consist of clean, sound, durable fragments of stone, free from an excess of flat, elongated, soft, or disintegrated pieces, dust, dirt, or other objectionable matter.

(b) Crushed Gravel. - Crushed gravel shall consist of clean, sound, durable pieces, free from an excess of soft, or disintegrated particles, dust, dirt, or other objectionable matter. At least 70 percent of the crushed gravel retained on the No. 4 sieve shall consist of fractured angular pieces.

(2) Gradation of Aggregates. - The crushed stone or crushed gravel shall conform to the grading shown below. The gradation of the aggregates shall be determined by ASTM Serial Designation C 136.

SECTION 42

BITUMINOUS SURFACE TREATMENT (ITEM 95)

42-01. SCOPE. - This section covers all operations in connection with the construction of bituminous surface treatment consisting of a prime coat and a double bituminous surface treatment on road gravel base, complete.

42-02. APPLICABLE PUBLICATIONS. - The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification.

a. Federal Specification. -

SS-A-671a.	Asphalt; Cut-Back (for) Road-Work.

b. American Society for Testing Materials Serial Designations. -

C 29-60.	Standard Method of Test for Unit Weight of Aggregate.
C 131-55.	Standard Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine.
C 136-39.	Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
D 75-59.	Methods of Sampling Stone, Slag, Gravel, Sand and Stone Block for Use as Highway Materials
D 140-55.	Standard Methods of Sampling Bituminous Material.

c. American Association of State Highway Officials Standard Method. -

T 102-42.	Standard Method of Spot Test of Asphaltic Materials.

42-03. DESCRIPTION. - The bituminous prime coat covered herein shall consist of an application of hot bituminous material on a previously prepared road gravel base. The double bituminous surface treatment for primed base courses shall consist of a first application

of bitumen covered with mineral aggregate properly compacted, followed by a second application of bitumen covered with mineral aggregate and rolled to a smooth surface presenting an even texture.

42-04. MATERIALS. - a. The bituminous material used for the prime coat shall be cutback asphalt and shall conform to the requirements of Federal Specification SS-A-671, designation MC-0 or MC-1, with the additional requirements that the residue from distillation to 680 degrees F. shall show a negative spot when submitted to AASHO Standard Method T 102, using standard naphtha specified in Paragraph 3 thereof. Application temperatures shall be as follows:

MC-0	50-120 degrees F.
MC-1	80-125 degrees F.

b. The materials used in the application of the double bituminous surface treatment shall be mineral aggregate and bituminous material, of the following types, gradations, grades, and consistencies:

(1) Mineral Aggregate. - Mineral aggregate shall consist of crushed stone or crushed gravel, free from adherent films of clay, and shall be of such nature that a thorough coating of the bituminous material used in the work will not strip off upon contact with water. The moisture content of the aggregate shall not be sufficient to prevent it from being readily coated with the bituminous material. Drying may be required as directed by the Contracting Officer. Aggregates shall have a percentage of wear not exceeding 40 after 500 revolutions, as determined by ASTM Serial Designation C 131.

(a) Crushed Stone. - Crushed stone shall consist of clean, sound, durable fragments of stone, free from an excess of flat, elongated, soft, or disintegrated pieces, dust, dirt, or other objectionable matter.

(b) Crushed Gravel. - Crushed gravel shall consist of clean, sound, durable pieces, free from an excess of soft, or disintegrated particles, dust, dirt, or other objectionable matter. At least 70 percent of the crushed gravel retained on the No. 4 sieve shall consist of fractured angular pieces.

(2) Gradation of Aggregates. - The crushed stone or crushed gravel shall conform to the grading shown below. The gradation of the aggregates shall be determined by ASTM Serial Designation C 136.

Percentage by weight passing square mesh sieves

Sieve Designation	Coarse Aggregate	Key Aggregate
3/4"	100	--
1/2"	90-100	--
3/8"	40-70	100
No. 4	0-15	85-100
No. 8	0-5	10-40
No. 16	---	0-10

(3) Bituminous Materials. - The bituminous materials used for the double bituminous surface treatment shall conform to the following:

(a) Rapid Curing Cut-Back Asphalt. - The rapid curing cut-back asphalt shall conform to the requirements of Federal Specification SS-A-671, Grade RC-4, or RC-5. In addition to the requirements of the Federal Specification, the residue from distillation to 680 degrees F. shall show a negative spot when submitted to AASHO Standard Method T 102, using the standard naphtha specified in Paragraph 3 thereof. Application temperatures shall be within the following ranges:

RC-4. . . . . 175-250 degrees F.
RC-5. . . . . 200-275 degrees F.

42-05. SAMPLING AND TESTING. - The source(s) from which the aggregates are to be obtained shall be selected in advance of the time when the materials are required for use in the work. Suitably sized samples of bituminous material together with a copy of their certified refinery analyses and samples of aggregates shall be submitted to the Contracting Officer for approval not less than 21 days before commencing the work. All sampling of materials, unless otherwise directed, shall be in accordance with ASTM Serial Designation D 75 for aggregates and ASTM Serial Designation D 140 for bituminous material. Only those materials that have demonstrated by service tests to be satisfactory for the work shall be used as approved by the Contracting Officer. All test samples shall be supplied by the contractor at his expense, and all tests will be made by the Contracting Officer, without cost to the contractor. Additional samples of materials shall be furnished by the contractor during construction, as required by the Contracting Officer. Sampling of materials will be observed and supervised by the Contracting Officer when deemed necessary.

42-06. QUANTITIES OF MATERIALS PER SQUARE YARD. - a. Bituminous material for the prime coat shall be applied at the approximate rate

of 0.40 gallon per square yard of base course. The exact quantity may be varied to suit field conditions.

b. The bitumen and aggregate for the double bituminous surface treatment shall be spread in the quantities shown below. Upon commencement of the work, and during its progress, the individual quantities of bitumen and aggregate may be varied to meet specific field conditions, as directed by the Contracting Officer, without adjustments to contract unit prices, but the amount in all cases shall be within the limits specified. The weights shown in this table are those of aggregates having a specific gravity of 2.65. If the specific gravity of the aggregate to be used is other than 2.65, appropriate adjustments shall be made in the number of pounds of aggregate required per square yard to insure a constant volume of aggregate per square yard of treatment.

Grading	Bitumen gallons per square yard First Application	Aggregate pounds per square yard First Spreading	Bitumen gallons per square yard Second Application	Aggregate pounds per square yard Second Spreading
Coarse Aggregate	0.25-0.35	35-45	---	---
Key Aggregate	---	---	0.20-0.30	15-25

42-07. EQUIPMENT. - All equipment, tools, and machines used in the performance of the work covered by this section of the specifications shall be subject to the approval of the Contracting Officer, and shall be maintained in satisfactory working condition at all times.

a. Bituminous Distributor. - Bituminous distributor shall have pneumatic tires of such width and number that the load produced on the base surface shall not exceed 650 pounds per inch of tire width. It shall be so designed and equipped as to distribute the bituminous material uniformly at even heat on variable widths of surface at readily determined and controlled rates ranging from 0.05 to 2.0 gallons per square yard, with a pressure range of from 25 to 75 pounds per square inch, with an allowable variation from any specified rate not exceeding 5 percent. The distributor equipment shall include an independently operated bitumen pump, tachometer, pressure gages, volume measuring devices, a thermometer for reading the temperature of tank contents, and a hose attachment suitable for applying bituminous material to spots missed by the distributor. The distributor shall be equipped for circulation and agitation of the bituminous material during the heating process.

b. Heating Equipment. - Heating equipment for heating bituminous materials shall consist of steam coils and equipment for producing steam, so designed that steam will not be introduced into the material. In the event storage tanks are used, an armored thermometer with a range from 50° F. to 400° F. shall be fixed to the tank so that the temperature of the bituminous material may be determined at all times.

c. Power Rollers. - Power rollers shall be steel-wheel or rubber-tired type conforming to the following requirements:

(1) Steel-wheel rollers shall be of either tandem or 3-wheel construction weighing not less than 5 tons, and shall be suitable for rolling bituminous pavements. The wheels of the rollers shall be equipped with adjustable scrapers. The rollers shall be equipped with water tanks and sprinkling apparatus that shall be used when necessary to keep the wheels wet, thus preventing adherence of bituminous material to the wheels.

(2) The rubber-tired roller shall be self-propelled and equipped with not less than 9 wheels mounted on 2 axles in such manner that the rear tires will not follow in the tracks of the forward group. The pneumatic roller shall also be equipped with suitable boxes or platforms for ballast loading and when loaded with ballast shall weigh not less than 10 tons. The tires shall be uniformly inflated to not less than 45 pounds per square inch pressure.

d. Mechanical Spreaders. - Mechanical spreaders shall be adjustable, and capable of spreading aggregate at controlled amounts per square yard.

e. Broom Drags. - Broom drags shall consist of brooms of the street type, mounted in a frame in such a manner as to spread the aggregate uniformly over the surface of the area to be treated. The drags shall be equipped with tow plates for towing. Towing equipment shall also be pneumatic-tired.

f. Power Brooms and Power Blowers. - Power brooms and power blowers shall be suitable for effectively cleaning the surfaces to be treated.

g. Rubber-Tired Rollers. - Rubber-tired rollers shall consist of 2 axles on which are mounted not less than 9 pneumatic-tired wheels in such manner that the rear group of tires will not follow in the tracks of the forward group. The axles shall be suitable for ballast loading. The tires shall be uniformly inflated. The rollers shall be weighted as directed by the Contracting Officer. The tractor or other towing equipment shall aslo be penumatic-tired.

h. Scales. - Scales shall be standard truck scales of the beam type. The scales shall be of sufficient size and capacity to accommodate all trucks used in hauling aggregates. All scales shall be tested and approved by an inspector of the state inspection bureau charged with scales inspection within the state in which the project is located.

42-08. WEATHER LIMITATIONS - The prime coat and double bituminous surface treatment shall be applied only when the base course is dry and when the temperature has not been below 35° F. for at least 12 hours immediately prior to application. The prime coat and double bituminous surface treatment shall not be applied when the atmospheric temperature is below 50° F.

42-09. CONDITIONING OF BASE COURSE. - The surfaces of the primed road gravel base course will be inspected and tested for tolerances by the Contracting Officer. Any deviations in excess of the specified requirements shall be corrected as directed by the Contracting Officer. Any ruts or soft-yielding spots that may appear in the base course shall be corrected by loosening, removing, or adding material, reshaping, and recompacting to line and grade, as directed by the Contracting Officer.

42-10. PREPARATION OF SURFACE. - Immediately before applying the prime coat, all loose material, dirt, clay, or other objectionable material, shall be removed from the surface to be primed with a power boom or blower supplemented with hand brooms, as directed by the Contracting Officer. After the cleaning operation, and prior to the application of the prime coat, an inspection of the area to be coated will be made by the Contracting Officer to determine its fitness to receive the bituminous priming material. That portion of the base course prepared for immediate treatment, if considered excessively dry, shall be lightly sprinkled with water immediately in advance of the application, as directed by the Contracting Officer, to assure a uniform spread of the bituminous material.

42-11. APPLICATION OF BITUMINOUS PRIME COAT MATERIAL. - Immediately following the preparation of the base course, the bituminous prime coat material shall be applied by means of a bituminous distributor at the applicable temperature specified above. The bituminous material shall be applied at the pressure and in the amounts as directed by the Contracting Officer. The priming material shall be so applied that uniform distribution is obtained at all points of the surface to be primed or treated. Unless the distributor is equipped so as to obtain satisfactory results at the junction of previous and subsequent applications, building paper shall be spread on the surface for a sufficient distance back from the ends of each application so that flow through the sprays may be started and stopped on the paper, and that all sprays will be operating at full force on the surface to be treated. Immediately after the application, the building paper shall be removed and destroyed. All spots unavoidably missed by the distributor shall be properly

treated with bituminous material. Following the application of prime material, the surface shall be allowed to dry for a period of not less than 48 hours without being disturbed, or for such additional period of time as may be necessary to attain penetration into the foundation course and drying out or evaporation of the volatiles from prime material, which period shall be determined by the Contracting Officer. The contractor shall furnish and spread sufficient approved sand on all areas which show an excess of bituminous material to effectively blot up and cure the excess, as directed. The primed surface shall be maintained by the contractor until the succeeding layer of pavement has been placed. During the interval, the contractor shall protect the primed surface against damage and shall repair all broken spots.

42-12. FIRST APPLICATION OF BITUMINOUS MATERIAL FOR DOUBLE SURFACE TREATMENT. - The first application of bituminous material for the surface treatment shall be applied by means of a bituminous distributor at the temperature determined by the Contracting Officer, within the ranges specified in Paragraph 42-04b(3). The bituminous material shall be applied at the pressure and in the amounts, within the limits specified in Paragraph 42-06, as determined by the Contracting Officer. The bituminous material shall be so applied that uniform distribution is obtained over all points of the surface to be treated. Unless the distributor is equipped so as to obtain satisfactory results at the junction of previous and subsequent applications, building paper shall be employed as specified above. All lightly coated areas and spots missed by the distributor shall be properly treated with bituminous material applied by hand.

42-13. FIRST SPREADING OF AGGREGATE. - Immediately following the first application of bituminous material for the double surface treatment, the coarser aggregate shall be spread uniformly over the surface, in amounts, within the limits specified above, as directed by the Contracting Officer. Spreading shall be done with aggregate spreading equipment of the type specified. The aggregate shall be spread evenly by hand on all areas missed by the aggregate spreader. Trucks spreading aggregate shall be operated backwards, so that the bituminous material will be covered ahead of the truck wheels. When hand spreading is employed, aggregate shall be dumped in piles adjacent to the area to be treated and spread by means of shovels. The aggregate shall be placed in sufficient quantities, within the limitations specified, to provide a small roll of surplus material ahead of the broom drag, thus preventing the broom drag from turning over the coated aggregate. Back-spotting or sprinkling of additional aggregate over areas having insufficient cover shall be done by hand and shall be continued during the operations whenever necessary.

42-14. BROOMING AND ROLLING FIRST COURSE. - The surface shall be rolled after sufficient aggregate is spread to prevent pick-up of the bituminous material, and rolling shall continue until no more aggregate can be worked into the surface. The surface shall be broom dragged as soon as possible after rolling, but not until the surface has set sufficiently to prevent excessive marking. Broom dragging shall continue until the aggregate is uniformly distributed

over the surface. Broom dragging, rolling, and back-spotting shall continue until the surface is cured and rolled sufficiently to key and set the aggregate, as approved by the Contracting Officer. In all places not accessible to the rollers, the aggregate shall be adequately compacted with hand tampers. Hand tampers shall weigh not less than 25 pounds and shall have a tamping face area of not more than 50 square inches. Any aggregate that becomes coated or mixed with dirt or any other foreign matter shall be removed, replaced with clean aggregate, and rerolled, as directed by the Contracting Officer. All surplus aggregate shall be swept off the surface and removed prior to the second application of bituminous material. The contractor shall maintain and protect the treated areas by barricades, if necessary, until the second application of bituminous material is applied.

42-15. SECOND APPLICATION OF BITUMINOUS MATERIAL. - The second application of bituminous material shall follow within 24 hours after the construction of the first course, weather permitting, unless the treated surface is excessively moistened by rain, when it shall be allowed to dry for such time as is deemed necessary by the Contracting Officer. The second application of bituminous material shall be applied in the manner specified for the first application, at the temperature as determined by the Contracting Officer, within the ranges specified. The bituminous material shall be also applied at the pressure and in the amounts, within the limits specified, as directed by the Contracting Officer.

42-16. SECOND SPREADING OF AGGREGATE. - Immediately following the second application of bitumen, the finer (key) mineral aggregate conforming to the grading specified shall be spread uniformly over the bituminous material in amounts, within the limits specified, as directed by the Contracting Officer. The aggregate shall be spread and processed in the manner specified above.

42-17. BROOMING AND ROLLING SECOND COURSE. - The surfaces shall be rolled and broom-dragged in the manner specified in paragraph 42-14 above, until a smooth, even textured surface is produced. All surplus aggregate shall be swept off the surface and removed prior to final acceptance.

42-18. PAYMENT. - Measurement will be by the square yard of surface actually receiving the bituminous treatment. Payment will be made at the contract unit price per square yard for Item 95, "Bituminous Surface Treatment", which price shall constitute full compensation for all work specified in this section, including prime coat and sand cover.

SECTION 43

TOPSOILING, SEEDING AND MULCHING
(Items 105, 106, and 107)

INDEX

Paragraph No.	Paragraph Title	Page No.
43-01	Scope	43-1
43-02	Definitions	43-1
	a. Earth Material	43-1
	b. Class A Seedbed	43-1
	c. Class B Seedbed	43-1
	d. Class D Seedbed	43-2
	e. Class D Seedbed	43-2
	f. Class A Seed[illegible] d	43-2
	g. Class B Seed	43-2
43-03	Procurement of Topsoil	43-2
43-04	Materials	43-2
	a. Fertilizer	43-2
	b. Lime	43-2
	c. Seed	43-2
	d. Mulch	43-3
43-05	Inspection and Tests	43-4
	a. Topsoil	43-4
	b Fertilizer and Lime	43-4
	c. Seed	43-4
	d. Mulch	43-4
	e. Nomenclature	43-5
43-06	Treatment of Areas to be Topsoiled and/or Seeded	43-5
43-07	Preparation of Subgrade	43-6
	a. General	43-6
	b. Grading	43-6
	c. Tilliage	43-6
	d. Approval	43-6
43-08	Placing Topsoil	43-6
43-08	Preparation of Seedbed	43-7
	a. General	43-7
	b. Fine Grading	43-7
	c. Application of Fertilizer and Lime	43-7
	d. Leveling	43-8

Paragraph No.	Paragraph Title	Page No.
43-10	Planting Seed	43-8
	a. General	43-8
	b. Treatment of Borrow Area B	43-8
	c. Rates	43-9
	d. Broadcast Seeding	43-9
	e. Drill Seeding	43-9
	f. Floss Spraying	43-9
43-11	Compacting	43-9
43-12	Applying Mulch	43-10
43-13	Securing Mulch	43-10
43-14	Protection	43-10
43-15	Clean-Up	43-10
43-16	Establishment	43-10
	a. General	43-10
	b. Watering	43-10
	c. Mowing	43-11
	d. Refertilizing and Reseeding	43-11
	e. Mulch	43-11
43-18	Cover Seeding	43-11
43-19	Additional Mulching	43-11
43-20	Measurement and Payment	43-12
	a. Topsoil	43-12
	b. Seeding	43-12
	c. Measurement	43-12
	d. Payment for Topsoiling or seeding	43-12
	e. Separate Payment	43-12

SECTION 43

TOPSOILING, SEEDING AND MULCHING
(Items 105, 106, and 107)

43-01. SCOPE. This section covers topsoiling and seeding, complete.

43-02. DEFINITIONS. - a. Earth Material. - The earth material consisting of the humus and the upper layer or layers of soil to a depth determined by the Contracting Officer, when used to construct a seedbed for the production of turf is defined as topsoil. Topsoil is classed as follows:

(1) Class A topsoil shall be salvaged from open fields and shall be natural, fertile, friable surface soil, without toxic substances injurious to vegetative growth, and clean and free from clay lumps, stones, clods, stumps, weed clumps, sticks, debris, and other objectionable matter two inches or more in any dimension. It shall be salvaged from the top 8 inches of stripped material.

(2) Class B topsoil shall be stripping material salvaged from construction and borrow areas. Stripping material which is to be used as Class B topsoil shall be cleaned by means of a bulldozer equipped with a root-raking blade or similar equipment so that it is reasonably free from stumps, logs, stones, roots and similar material having a maximum dimension of 8 inches or over.

(3) Class C topsoil shall be stripping material salvaged from construction and borrow areas. Material which will interfere with placement, grading and seeding operations shall be removed.

(4) All material such as stones, roots, stumps, and other debris removed from topsoil in the process of cleaning it shall be transported and deposited in a designated spoil area.

b. Class A Seedbed. - A class A seedbed is a seedbed constructed by preparing the subgrade as required by Paragraph 43-07 of this section of the specifications, applying eight inches of class A topsoil, and grading to the required limits.

c. Class B Seedbed. - A class B seedbed is a seedbed constructed by preparing the subgrade as required by Paragraph 43-07 of this section of the specifications, applying a minimum of 8 inches of class B topsoil as required, and grading to the required limits; except that where directed, the thickness shall be 24 inches over exposed rock surfaces. Class A topsoil may be substituted for class B topsoil.

d. Class C Seedbed. - Class C seedbed is a seedbed constructed by preparing the subgrade as required by Paragraph 43-07 of this section of the specifications, applying a minimum of 8 inches of class C topsoil as required, and grading to required limits.

e. Class D Seedbed. - Class D seedbed is a seedbed constructed by properly preparing the soil surface in place after other operations have been completed. No topsoiling is required unless topsoiling is a part of another operation.

f. Class A Seed. - Class A seed is a seed mixture designed to produce a high quality lawn, and shall have a content as stated in Paragraph 43-04c of this section of the specifications.

g. Class B Seed. - Class B seed is a seed mixture designed to produce heavy turf to prevent surface erosion, and shall have a content as stated in Paragraph 43-04c of this section of the specifications.

43-03. PROCUREMENT OF TOPSOIL. - It shall be the responsibility of the contractor to salvage from construction and graded areas sufficient topsoil of the required classes to complete topsoiling as specified. Topsoil shall not be hauled, applied, or worked while in a frozen or muddy condition.

43-04. MATERIALS. - a. Fertilizer. - Fertilizer shall be 10-6-4 grade, uniform in composition, granular free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trade-mark, and warranty of the producer.

b. Lime. - Lime shall be ground limestone containing not less than 85 percent of total carbonates and shall be ground to such fineness that at least 50 percent will pass through a 100-mesh sieve and at least 90 percent will pass through a 20-mesh sieve. Coarser materials will be acceptable provided the specified rates of application are increased proportionately, on the basis of quantities passing the 100-mesh sieve, but no additional payment will be made for the increased quantity.

c. Seed. - All seed used shall be labeled in accordance with U. S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation for Bids. All seed shall be furnished in sealed standard containers, unless exception is granted in writing by the Contracting Officer. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable. The analysis of seed in each lot of mixture shall be as follows:

Kind of Seed	% by Wt. In Mixture	Min. % Purity	Min. % Germ.
CLASS A SEED			
Agrostis Tenuis hv. Highland Bentgrass	10	98	85
Festuca rubra Red Fescue (Columbia Cy. Strain)	35	98	85
Festuca rubra commutata Chewings Fescue	35	98	85
Poa pratensis Kentucky Bluegrass	15	85	75
Trifolium repens White Clover	5	98	85
CLASS B SEED			
Agrostis tenuis hv. Highland Bentgrass	5	98	85
Bromus inermis Smooth Brome	10	85	90
Festuca elatior arundinaceae hv Alta Fescue	30	98	85
Festuca rubra Red Fescue (Columbia Cy. strain)	35	98	85
Poa compressa Canada Bluegrass	15	80	75
Trifolium repens White Clover (New York Wild Strain)	5	98	85

1. For grass seed Classes A & B, weed seed not to exceed 1.0% of total mixture.

d. Mulch. - (To be used only on slopes of 1 on 5 or steeper. No mulching in Borrow Area B.)

(1) General. - Acceptable mulch shall be any of the following materials, or any approved locally available material other than these specified. Mulch material which contains an excessive quantity of matured seed of noxious weeds or other species which would grow and be detrimental to the desired turf, or provide a menace to surrounding farm land will not be acceptable. Material that is easily shifted by moderate wind action, or material that is caked or tightly matted, and will smother or excessively retard the growth of grass, will not be acceptable.

(a) Straw. - Straw shall consist of the threshed stalks of oats, wheat, barley, rye, flax, beans or peas.

(b) Hay. - Hay shall be cured, dried and shall be made up of native grasses, marsh or beach grasses.

43-05. INSPECTION AND TESTS. - a. Topsoil. - The topsoil proposed for use will be inspected by the Contracting Officer. At the time of inspection, the Contracting Officer will require representative soil samples to be taken, to be tested for physical properties and pH (or lime requirement), for organic matter, and for available phosphoric acid and potash. Samples shall be supplied by the contractor at the contractor's expense, and tests will be made under the supervision of the Contracting Officer without cost to the contractor. Sampling and testing will be in accordance with standard practices of soil testing.

b. Fertilizer and Lime. - Fertilizer and lime shall be of the required grades, uniform in composition, free-flowing and suitable for application with approved equipment, delivered to the site in bags or other convenient containers, each fully labeled, conforming to the applicable State fertilizer laws, and bearing the name, trade name or trade-mark, and warranty of the producer. The Contracting Officer shall be furnished with duplicate copies of invoices for all fertilizer and lime used on the project. Invoices for fertilizer shall show the grade furnished. Invoices for lime shall show total minimum carbonates and minimum percentages of the material furnished that pass the 100- and the 20-mesh sieves. Each lot of fertilizer and lime shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the official methods of the Association of Official Agricultural Chemists. Upon completion of the project, a final check of the total quantities of fertilizer and lime used will be made against the total area seeded, and, if the minimum rates of application have not been met, the Contracting Officer may require the distribution of additional quantities of these materials to make up the minimum application specified.

c. Seed. - The Contracting Officer shall be furnished with duplicate signed copies of a statement from the seed vendor, certifying that each container of seed delivered is fully labeled in accordance with the Federal Seed Act and is at least equal to the specification requirements specified hereinbefore, as furnished with the purchase order. This certification shall appear on, or with, all copies of invoices for the seed. Each lot of seed shall be subject to sampling and testing at the discretion of the Contracting Officer. Sampling and testing will be in accordance with the latest Rules and Regulations under the Federal Seed Act.

d. Mulch. - Not less than 30 days prior to date of intended use, the contractor shall notify the Contracting Officer of the sources from which the mulch materials are to be secured and the quantities thereof, and representative samples of the materials proposed to be used shall be furnished for approval.

e. Nomenclature. - The scientific and common names of seed materials specified herein conform with the latest approved names listed in "Standardized Plant Names: (1942 Edition) prepared by the American Joint Committee on Horticultural Nomenclature. Variety names not included therein are in conformance with names adopted by the U. S. Department of Agriculture and generally accepted in the seed trade.

43-06. TREATMENT OF AREAS TO BE TOPSOILED AND/OR SEEDED. - The following areas shall be topsoiled, seeded, mulched, and otherwise treated as required by this section of the specifications.

a. Areas as indicated on the drawings.

b. Areas not indicated on the drawings but which fall within the meaning of GC-9. These areas shall be treated at no additional cost to the Government.

c. Areas falling outside the limit of work line, areas within the limit of work line where no work is indicated on the drawings, and areas used for the convenience of the contractor including haul roads, storage areas, access roads, field office sites, parking areas, stockpile areas and areas of similar use, unless specifically exempted in writing by the Contracting Officer. These areas shall be treated at no additional cost to Government.

d. Areas as required by other sections of these specifications. The provisions of this paragraph do not exempt the contractor from responsibility for vegetation other than grass, such as trees and shrubs, in accordance with GC-9 of these specifications.

e. The following areas shall be treated as specified herein.

(1) Class A Seedbed, Class A Seed.

(a) Service areas (Utility Building and Parking Lot) and Operator's Quarters residence area.

(b) Turnaround and flagpole area, west end of dam.

(2) Class B Seedbed, Class B Seed.

(a) All road slopes, except as noted in subparagraph 43-06e (1) above or otherwise indicated.

(b) Cut slopes in earth above the rock surface along both the flood control intake and spillway channel, except below permanent pool elevation.

(3) Class C Seedbed, Class B Seed. All slopes and disturbed areas comprising and adjacent to Borrow Area "B". The applicable provisions of the EXCAVATION section of these specifications generally cover the requirements in the treatment of Borrow Area "B".

(4) Class D Seedbed, Class B Seed. The area comprising and adjacent to the spoil area on the upstream toe of the dike.

43-07. PREPARATION OF SUBGRADE. - a. General. - The area to be topsoiled and areas requiring other treatments are shown on the drawings and described in Paragraph 43-06 of this section of the specifications. Equipment necessary for the proper preparation of the ground surface and for handling and placing all materials required shall be on hand, in good condition, and shall be approved by the Contracting Officer before the work is started. Prior to grading and tillage operations, all heavy growth of vegetation of the areas to be treated sufficient to interfere with grading or tillage operations shall be mowed, grubbed, and raked, and burned or removed from the site. Prior to or during grading and tillage operations, the ground surface shall be cleared of all stumps, large stones, roots, cable, wire, grade stakes, and any other materials which might hinder proper grading, tillage or subsequent maintenance operations.

b. Grading. - Grades on the areas to be topsoiled which have been previously established, as shown on the drawings, shall be maintained in a true and even condition. Maintenance shall include any necessary repairs to previously graded areas. Where the grades have not been established, the areas shall be graded as shown on the drawings, and all surfaces shall be left at the prescribed grades in an even and properly compacted condition so as to prevent the formation of depressions where water will stand.

c. Tillage. - After the areas required to be treated have been brought to the proper subgrade parallel to the finished grades shown on the drawings, and immediately prior to dumping and spreading Class A and Class B topsoil, or prior to seeding if no topsoil is required, the subgrade shall be loosened by disking, or by scarifying to a depth of at least 2 inches, to permit bonding of the topsoil to the subgrade. On banks and inclines, the subgrade finish shall be loosened by harrowing in rows parallel to the contours of the slope. All other equipment to be employed on such slopes shall be operated similiarly.

d. Approval. - There shall be no application of topsoil made without the prior approval of the finished subgrade by the Contracting Officer.

43-08. PLACING TOPSOIL. - The topsoil shall be uniformly distributed on the areas designated, and evenly spread, and in sufficient depth to compensate for any shrinkage, so that the thickness of the compacted

topsoil shall be as provided by the drawings and by the provisions of other paragraphs of this section of the specifications. Topsoil shall be compacted with two coverages of the treads of a crawler type tractor. The topsoil depth shall be measured perpendicular to the plane of the finished grade. The spreading shall be performed in such a manner that fine grading, fertilizing, liming and seeding can proceed with little additional soil preparation or tillage. Any irregularities in the surface resulting from operations thereon shall be corrected to prevent the formation of depressions where water will stand. Topsoil shall not be placed or worked when it or the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to the proposed seeding or to proper grading. Topsoiling shall be performed only when it can be followed within a reasonable time by seeding. In the borrow area, the spreading of stripping material (Class B topsoil and Class C topsoil) will not be required on bedrock slopes steeper than 3 horizontal on 1 vertical or on bedrock ridges or knobs of sufficient irregularity to require special construction methods for the spreading of stripping material. In borrow area B, the spreading of stripping material will not be required on extensive surfaces of exposed rock.

43-09. PREPARATION OF SEEDBED. - a. General. - It shall be demonstrated to the Contracting Officer before starting work that the application of fertilizers, lime, and seed required will be made uniformly and at the specified rates.

b. Fine Grading. - The seedbed shall be brought to the required finished grades, free from unsightly variations, lumps, ridges, and depressions. During such operations and prior to seeding, the surface of areas receiving class A topsoil, shall be cleared of all stumps, stones and other objects having a dimension of 1 inch or more, and a finely pulverized seedbed shall be formed. Areas receiving class B and class C topsoil shall have the surface reasonably clean and free from stumps, stones and other material which might injure development of maintenance of vegetative cover. Class D seedbeds shall be cleaned of debris and other material of objectionable size.

c. Application of Fertilizer and Lime. - Fertilizer and lime shall be distributed uniformly over the areas specified to be topsoiled and seeded, in accordance with the following schedule.

(1) Areas having Class A seedbed with Class A seed, and Class B seedbed with Class B seed.

Fertilizer	1000 lbs/acre
Lime	2 tons/acre

(2) Borrow Area B. - Class C, seedbed, Class B seed.
Lime, 1,500 lbs per acre applied hydraulically.
Fertilizer, 10-6-4, 1000 lbs/acre applied hydraulically.

(3) Class D seedbed, Class B seed.

Fertilizer	800 lbs/acre
Lime	2 tons/acre

Each material shall be incorporated independently into the top 3 inches of soil by disking, harrowing, drill, or other methods acceptable to the Contracting Officer during fine grading operations, or in combination without lime by floss-sprayer after the bulk of fine grading work has been done. Distribution of fertilizer and seed may be accomplished simultaneously by means of an approved seed drill equipped to sow seed and distribute fertilizer at the same time, or by floss-sprayer, at the appropriate stage for seeding operations. All materials must be applied hydraulically to Borrow Area B.

d. Leveling. - Any undulation or irregularities in the surface resulting from tillage, fertilizing, liming, or other operations shall be leveled out before seeding operations are begun. No seeding shall be done until the prepared seedbed has been approved by the Contracting Officer.

43-10. PLANTING SEED. - a. General. - All seeding work shall be done between the dates of 15 April and 1 June or between 15 August and 15 September unless otherwise directed in writing by the Contracting Officer. A method of sowing satisfactory to the Contracting Officer shall be employed, making use of approved mechanical power-drawn drills or seeders, mechanical hand-seeders, floss-sprayers, or other approved methods. When drills are used, provision shall be made by markers or other means to assure that the successive seeded strips will overlap or be separated by a space no greater than the space between the rows planted by the equipment being used. When delays in operation carry the work beyond the most favorable planting season for the species designated, or when conditions are such, by reason of drought, high winds, excessive moisture, or other factors, that satisfactory results are not likely to be obtained, the Contracting Officer will stop the work, and work shall be resumed only when conditions are favorable again or when approved alternate corrective measures and procedures have been put into effect. If inspection during seeding operations or after there is a show of green indicates that strips wider than the space between the rows planted have been left, or other areas skipped or too sparsely seeded, the Contracting Officer may require corrective work and the sowing of additional seed on such areas.

b. Treatment of Borrow Area B. - Treatment of Borrow Area B shall be accomplished in increments. During the fall 1963 planting season, that portion of the Borrow Area where excavation has been completed

shall be trimmed and graded to meet the requirements of these specifications, shall have stripping material as specified hereinbefore, and shall be seeded as required.

c. Rates. - (1) Seed shall be sown at the following minimum rates.

Class A Seed:	4 lbs/1000 sq. ft.
Class B Seed:	120 lbs/acre

d. Broadcast Seeding. - Seed shall be broadcast by approved sowing equipment. The seed shall be uniformly distributed over the designated areas. Half the seed shall be sown with the sower moving in one direction, and the remainder shall be sown with the sower moving at right angles to the first sowing. The seed shall be covered to an average depth of 1/4 inch by means of a brush harrow, chain harrow, cultipacker, or other approved device. Broadcast seeding shall not be done during windy weather.

e. Drill Seeding. - Drill seeding shall be done with approved equipment with drills not more than 2 inches apart. The seed shall be sown uniformly over the designated areas, and covered to an average depth of 1/4 inch concurrently with the sowing.

f. Floss Spraying. - The application of fertilizer and seed may be accomplished in one operation by the use of an approved spraying machine. The materials shall be mixed with water in the machine and kept in an agitated state in order that the materials may be uniformly suspended in the water. The spraying equipment shall be so designed that when the solution is sprayed over an area resulting deposits of fertilizer and seed shall be equal in quantity to those quantities specified herein. In no case shall lime be sprayed simultaneously with fertilizer and seed, nor shall any materials be used that have been standing in solution for a period exceeding 8 hours. After the spraying has been accomplished, the surface of the loam shall be rolled as specified below. If the results of the spraying operation are unsatisfactory, the contractor will be required to abandon this method and to apply the materials as described hereinbefore.

43-11. COMPACTING. - Immediately after the operations specified above have been completed, the entire area, except floss sprayed areas, shall be compacted by means of a cultipacker, roller, or other approved equipment weighing 60 to 90 pounds per linear foot of roller. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic roller (not wobble-wheel) will be required. The pneumatic roller shall have tires of sufficient size so that complete coverage of the soil surface is obtained. When a cultipacker or similar equipment is used, the final rolling shall be at right angles to the existing slopes to prevent water erosion or at right angles to the prevailing wind to prevent dust, as directed by the Contracting Officer.

43-12. APPLYING MULCH. - The mulch shall be spread uniformly in a continuous blanket, as follows: Straw, or hay, at the rate of 2 tons per acre. The mulch shall be spread by hand or by use of a manure spreader, a modified grain combine with straw-spreader attachment, or other suitable equipment. Mulching shall be started at the upper part of a slope, and shall continue uniformly until the area is completely covered.

43-13. SECURING MULCH. - Immediately following the spreading of the mulch, the material shall be anchored to the soil by a V-type-wheel landpacker, a disk harrow set to cut only slightly, a rotary hoe run backwards, or other suitable equipment which will secure the mulch firmly in the ground to form a soil-binding mulch and prevent loss or bunching by wind. The number of passes over the mulch needed to secure it firmly to the soil shall be as determined by the Contracting Officer, but shall in no case exceed three passes. On slopes where machinery cannot be used, mulch shall be retained in place by a shallow covering of earth, by pressing into the soil at 18 inch intervals with a spade or other approved tool, by twine, stakes, or brush, or by other suitable means which will not be detrimental to subsequent maintenance.

43-14. PROTECTION. - The area shall be protected against traffic or other use by erecting barricades or a substantial wire and stake enclosure immediately after seeding and mulching operations have been completed, and by placing warning signs of a type approved by the Contracting Officer on the completed areas. The contractor shall repair any damage resulting from his operations. All mulch material which has been removed from the site by wind or from other causes shall be replaced and secured. Repair work which is required because of the contractor's negligence shall be performed without cost to the Government.

43-15. CLEAN-UP. - The contractor shall leave each area neat and clean, with adjacent turf and tree-covered areas raked of extraneous matter, and with all debris, removed from the site. Any paved area over which hauling operations are conducted shall be kept clean and any top-soil, mulch, clippings, or other approved materials which may be brought upon the paved surface shall be removed promptly.

43-16. ESTABLISHEMENT. - a. General. - The contractor shall be responsible for the proper care of the seeded areas during the period when the grass is becoming established including watering. This period shall extend for 45 days after the completion of the seeding on the entire project, if seeding is completed during the Spring seeding season. When seeding is completed during the Fall seeding season, the maintenance period shall extend until May 15 of the succeeding year.

b. Watering. - All seeded areas shall be watered during the establishment period whenever considered necessary by the Contracting Officer. Seeded areas on which grout has started shall be watered to a minimum depth of 2 inches to assure continuing growth. Watering shall be done in a manner which will provide uniform coverage, prevent erosion due to application of excessive quantities over small areas, and prevent damage to the finished surface by the watering equipment.

c. Mowing. - The seeded areas, except borrow areas, shall be mowed with approved mowing equipment to a height of 2 inches when the average height of grass becomes 4 inches for initial mowing and 3 inches for all subsequent mowings. If weeds or other undesirable vegetation threatens to smother the planted species, such vegetation shall be mowed or, in the case of exceedingly rank growth, be uprooted, raked, and removed from the area.

d. Refertilizing and Reseeding. - Areas which, in the opinion of the Contracting Officer, fail to show a good growth of grass during the period of establishment cited above shall be refertilized and reseeded. Areas that require refertilization and reseeding will be designated by the Contracting Officer at least 15 days prior to the period specified for the next seeding season. The fertilizer shall be distributed on the areas to be reseeded during a period when the surface is dry. Reseeding shall be done in a manner that will cause a minimum of disturbance to the existing stand of grass. The fertilizer and seed shall be of the same grade, physical condition, packaging and marking, and shall be applied at the rates specified hereinbefore.

e. Mulch. - Mulch shall be removed if and when it is required by the Contracting Officer.

43-17. REPAIR. - When any portion of the surface becomes gullied, eroded, or otherwise damaged following seeding and mulching, or the seedlings have been winter-killed or otherwise destroyed through no fault of the contractor, the contractor shall, within 15 days of written notice by the Contracting Officer, restore the damaged portions to re-establish the condition of the finished grade prior to seeding. The area shall then be refertilized, reseeded and mulched as specified herein, and an equitable adjustment made in the contract price. The provisions of this paragraph become applicable only after all other requirements of this section of the specifications have been completed.

43-18. COVER SEEDING. - Cover seeding, when required, will be accomplished without fine grading, fertilizer or liming operations. The seed shall consist of Hairy Vetch or Common Buckwheat, applied at the rate of 60 pounds per acre. If cover seeding is required, together with the reconstruction of the turf bed and subsequent grass seeding in accordance with this specification, an equitable adjustment in the contract price will be made.

43-19. ADDITIONAL MULCHING. - When required by the Contracting Officer, slopes less than 1 on 5 and flat areas shall be mulched as specified herein, and an equitable adjustment will be made in the contract price.

43-20. MEASUREMENT AND PAYMENT. - a. Topsoil. - No separate payment will be made for stripping, stockpiling, transporting or placing topsoil, and all costs in connection therewith will be considered as operations subsidiary to the requirements of the Section, EXCAVATION, of these specifications.

b. Seeding. - Payment will be made for seeding on the basis of the number of square yards of seeding measured as specified in Paragraph 43-20e, acceptably done, computed from the neat lines and grades indicated on the drawings or as stated in the field. Payment for seeding will be made at the contract unit price per square yard, which price shall include all cost of preparation of subgrade and/or seedbed, grading, application of fertilizer and lime, grading, seeding, mulching, establishment, repair, and the furnishing of all labor, materials including seed, fertilizer, lime, mulch, equipment and incidentals necessary to complete the seeding. Payment will be made on the basis of the following types of seedbed and/or seed application actually completed.

(1) Class A Seedbed, Class A Seed. (Item 105)

(2) Class B Seedbed, Class B Seed. (Item 106)

(3) Class D Seedbed, Class B Seed. (Item 107)

c. Measurement. - Measurement of areas to be seeded, as specified in Paragraph 43-20b above will be made as follows.

(1) On slopes of surfaces to be seeded, measurement shall be made normal to and parallel to the slopes, and the actual area computed.

(2) Measurement of all other areas shall be computed by measuring their horizontal projections.

d. The payment for topsoiling or seeding does not include compensation for clearing and grubbing which is paid for in accordance with Section 1 or as subsidiary to borrow excavation. The payments for topsoiling or seeding does not include compensation for topsoiling or seeding for areas specified in Paragraphs 43-06b, c, and d. and 43-06e(3), and all costs in connection therewith shall be considered as a subsidiary obligation of the contractor.

e. No separate payment will be made for topsoiling and seeding the borrow area B. All costs in connection with seeding, fertilizing, furnishing seed and fertilizer, and all work in connection with topsoiling, seeding and fertilizing the borrow area shall be included in the contract unit price for Item No. 4, "Unclassified Excavation, Borrow 'B'".

f. The quantities and types of lime, fertilizer and seed specified indicate anticipated average requirements. In the event changes are necessary in quantities or type of materials, a suitable adjustment to the contract will be made to cover the changes.

g. In the event repairs, as specified in Paragraph 43-17, are required due to no fault of the contractor, an equitable adjustment will be made to the contract.

h. In the event cover seeding is required, as specified in Paragraph 43-18, an equitable adjustment will be made to the contract.

Connecticut River Flood Control Project - Westfield River Littleville Dam Plans - 1962



1962 Reports

Plans for construction of Littleville

Dam, highway relocations & appurtenant structures. Middle branch Westfield River.

City/Town	Chester
City/Town	Westfield
Dam	Littleville Dam
Name	Massachusetts Comm
Name	U S Army Engineers
Water	Westfield River
Water	Connecticut River

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

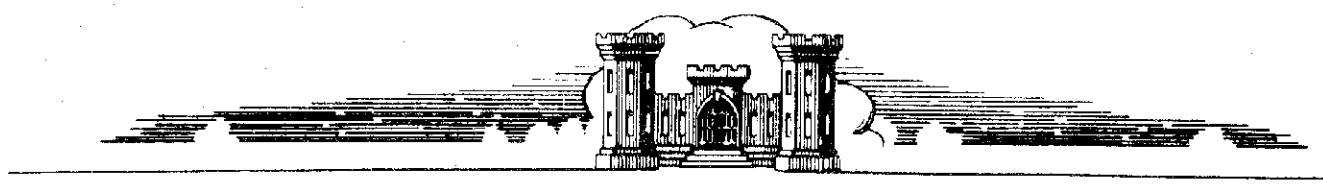
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PLANS FOR THE

CONSTRUCTION OF DAM

AND

APPURTENANT STRUCTURES

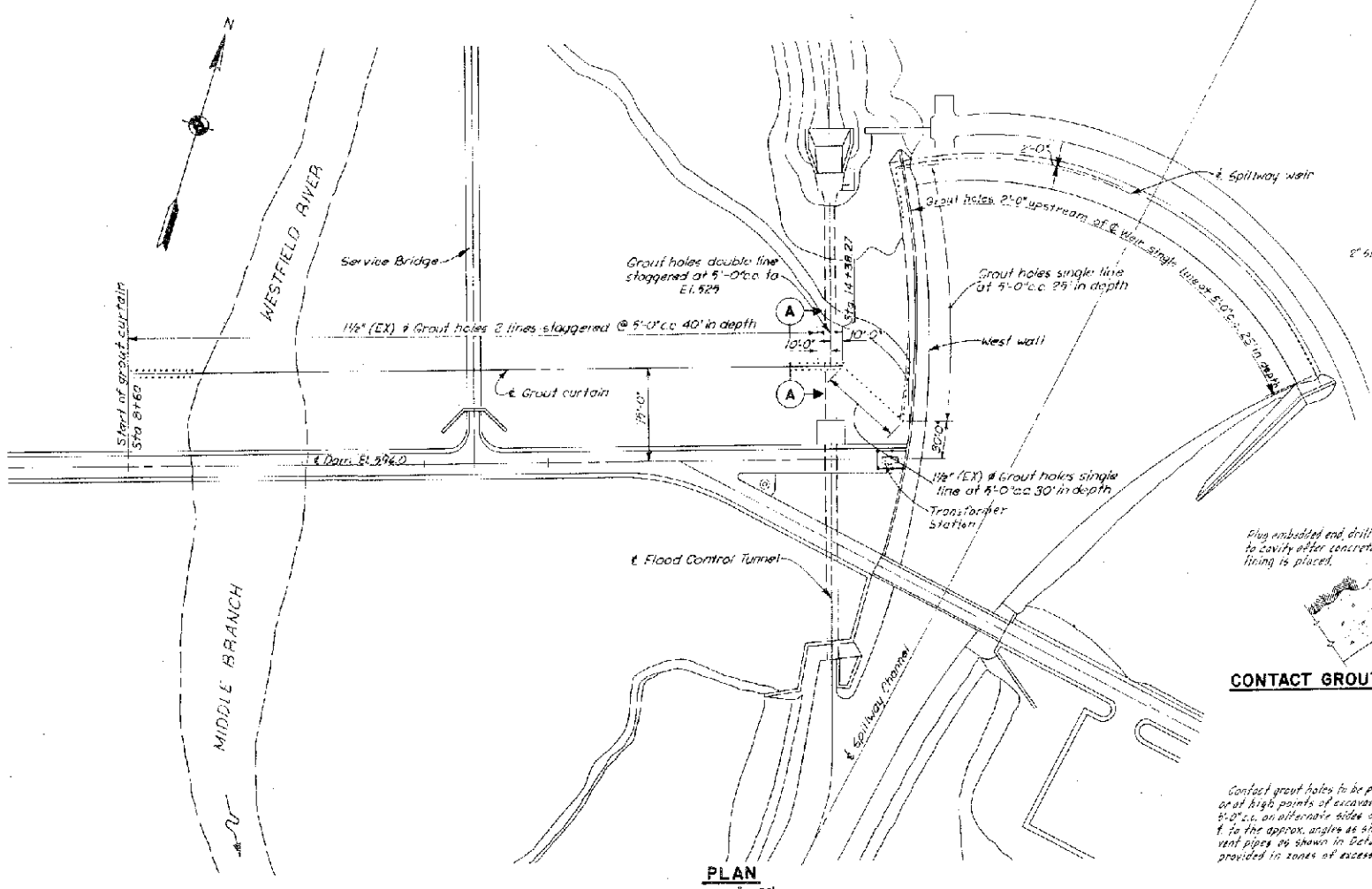


U.S. Army Engineer Division, New England
Corps of Engineers Waltham, Mass.

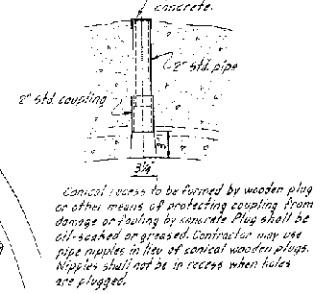
MARCH 1962

All drawings in this folio have been reduced to one half the original scale.

CORPS OF ENGINEERS — U. S. ARMY

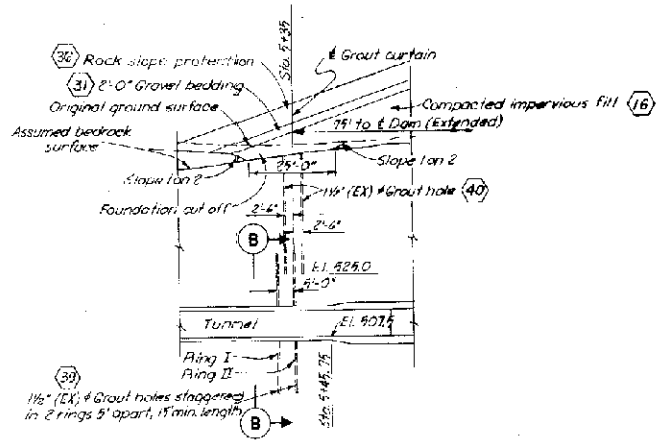


PLAN
SCALE 1" = 50'

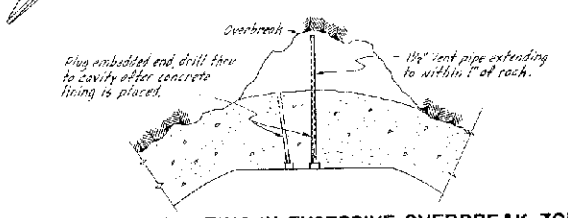


Conical reamer to be formed by wooden plug or other means of protecting coupling from damage or fouling by concrete. Plug shall be oil-coated or greased. Contractor may use pipe nipples in lieu of conical wooden plugs. Nipples shall not be in recess when holes are plugged.

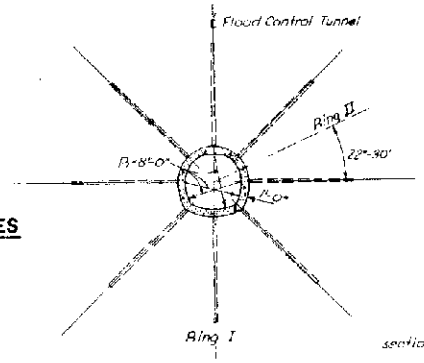
GROUT PIPE DETAIL
NOT TO SCALE



SECTION A-A
SCALE 1" = 20'



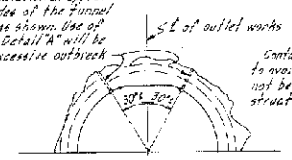
CONTACT GROUTING IN EXCESSIVE OVERBREAK ZONES
DETAIL "A"
NOT TO SCALE



SECTION B-B
SCALE 1" = 10'

Grout curtain omitted from this section, for clarity.
Ring II (not shown) is rotated 22°-30' from Ring I as indicated.
1½" (EX) ϕ Grout holes 15' minimum depth, penetration and/or 10' minimum penetration beyond natural fracturing or fracturing caused by tunnel excavation.

Contact grout holes to be placed beneath or at high points of excavation at approx. 5'-0" c.c. on alternate sides of the Tunnel ℄ to the approx. angles as shown. Use of vent pipes as shown in Detail "A" will be provided in zones of excessive overbreak.

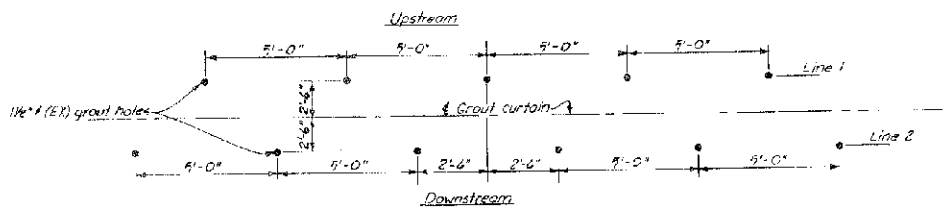


Contact grout holes will be located to avoid imbedded items and will not be placed closer than 1'-0" to structural joints in the concrete.

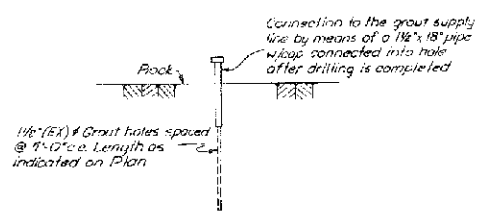
Contact grout holes in the transition sections will be located at approximately 5'-0" c.c. longitudinally, and at a lateral spacing to most advantageously seal existing voids between the rock and the concrete.

CONTACT GROUT DETAIL
NOT TO SCALE

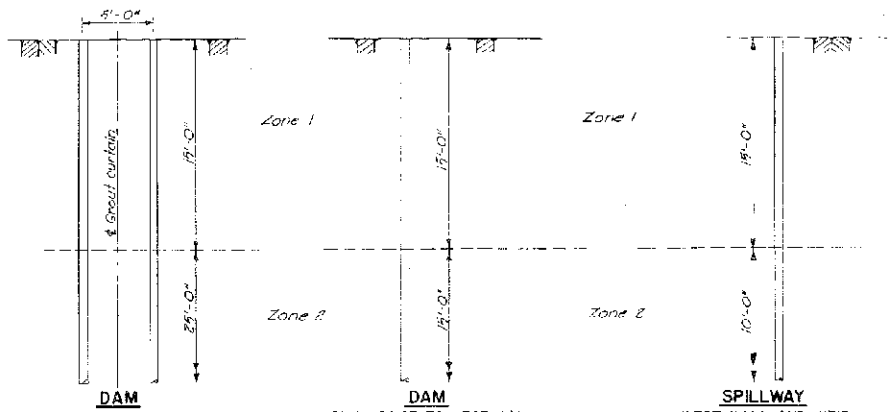
NOTES:
Elevations refer to Mean Sea Level Datum.
Tunnel drilling and grouting to be paid for under Item No. 39.
Foundation drilling and grouting to will be paid for under Item No. 40.



PLAN
TYPICAL INITIAL GROUT HOLE SPACING ALONG DAM FOUNDATION CUTOFF
(NOT TO SCALE)



GROUT HOLE DETAIL
(NOT TO SCALE)



DAM
STA. 8+60 TO STA. 14+38.27

DAM
STA. 14+38.27 TO WEST WALL OF SPILLWAY

SPILLWAY
WEST WALL AND WEIR

NOTE:
Grouting in Zone 1 to be completed prior to grouting Zone 2.
Exposed rock surface in base of Foundation Cutoff to be 1 and cleaned

TYPICAL SECTIONS - GROUT CURTAIN
(NOT TO SCALE)

GRAPHIC SCALES
1" = 10' 10' 0 10' 20'
1" = 20' 20' 0 20' 40'
1" = 50' 50' 0 50' 100'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

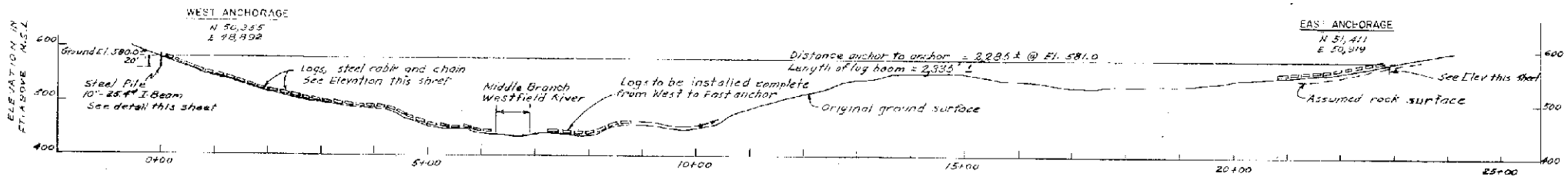
DES. BY P.H. | DR. BY F.L.C. | CK. BY J.H.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GROUTING PLAN AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

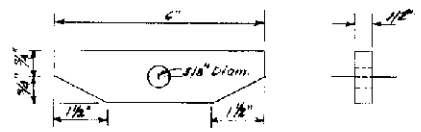
PROJECT ENGINEER
APPROVAL RECOMMENDED — CHIEF, CE BRANCH
APPROVED — CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-45
DRAWING NUMBER CT-1-5732
SHEET 26

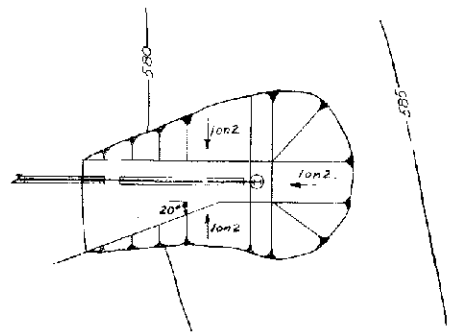
CORPS OF ENGINEERS — U. S. ARMY



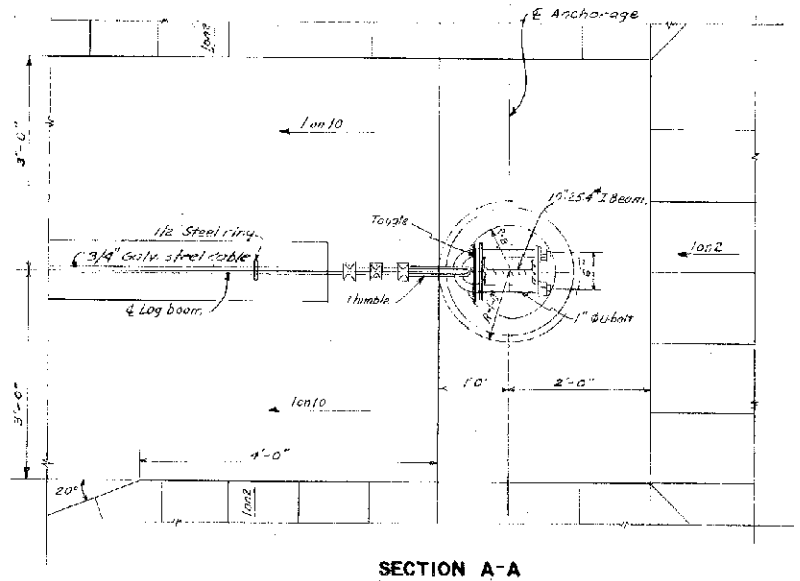
PROFILE ALONG ℄ LOG BOOM
(LOOKING UPSTREAM)
SCALE: 1"=100'



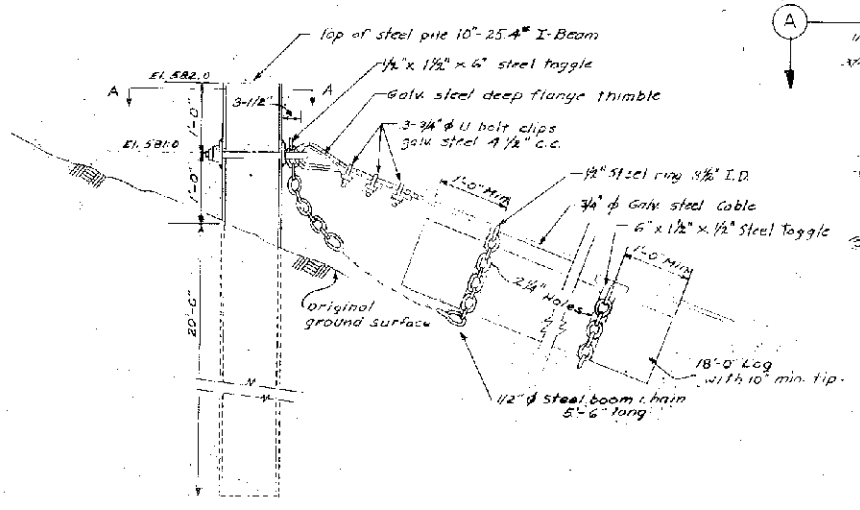
DETAIL STEEL TOGGLE
SCALE: 6"=1'-0"



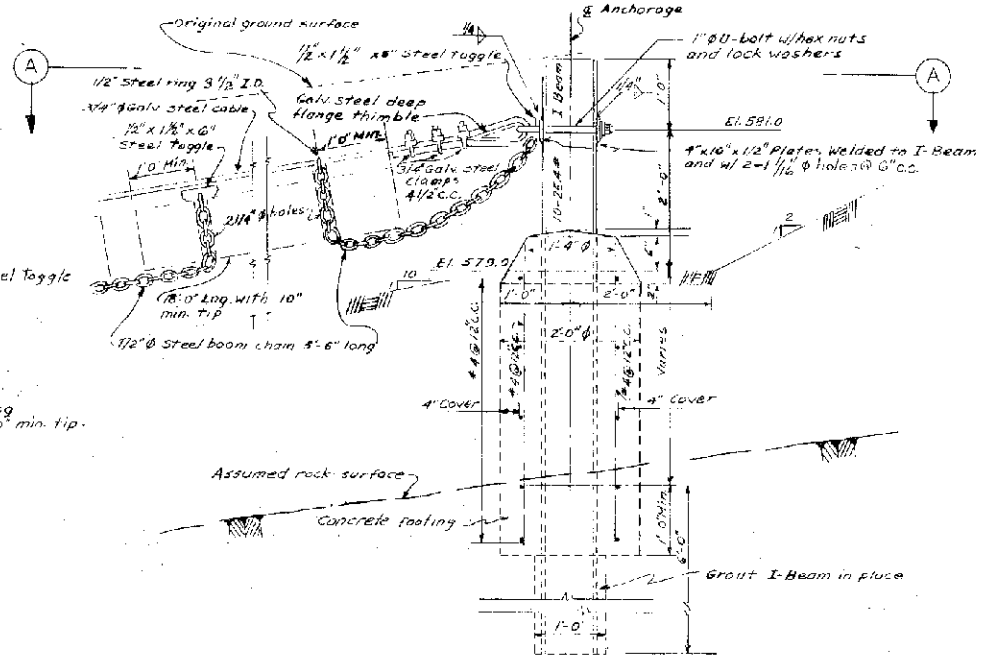
PLAN-EAST ANCHOR
SCALE: 1"=10'



SECTION A-A
SCALE: 1"=1'-0"



ELEVATION-WEST ANCHOR
SCALE: 1"=1'-0"



ELEVATION-EAST ANCHOR
SCALE 1"=1'-0"

NOTES.
Elevations refer to Mean Sea Level Datum
For location of Log Boom See Sheet No. 2.
Log Boom and accessories will be paid for under Item No. 93.

GRAPHIC SCALES

1" = 1'-0"	1' 0 1' 2'
1" = 10'	10' 0 10' 20'
1" = 100'	100' 0 100' 200'
6" = 1'-0"	6" 0 6" 12"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B	W.M.B	P.H.

PROJECT ENGINEER

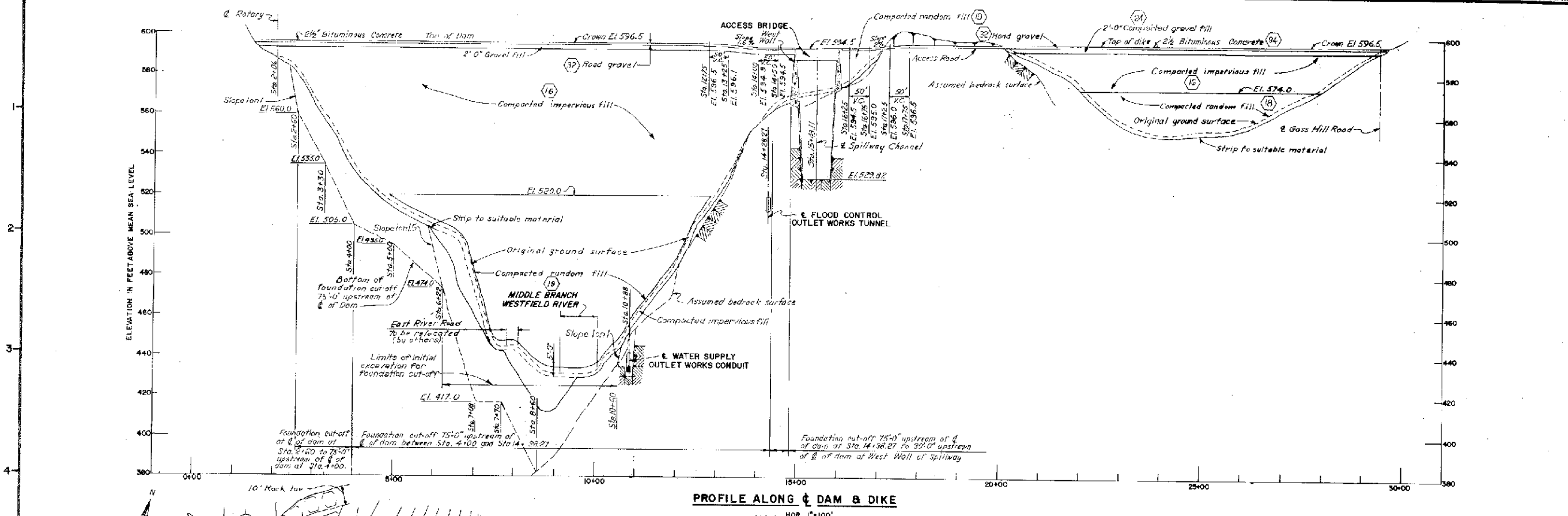
APPROVED RECOMMENDED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
LOG BOOM DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

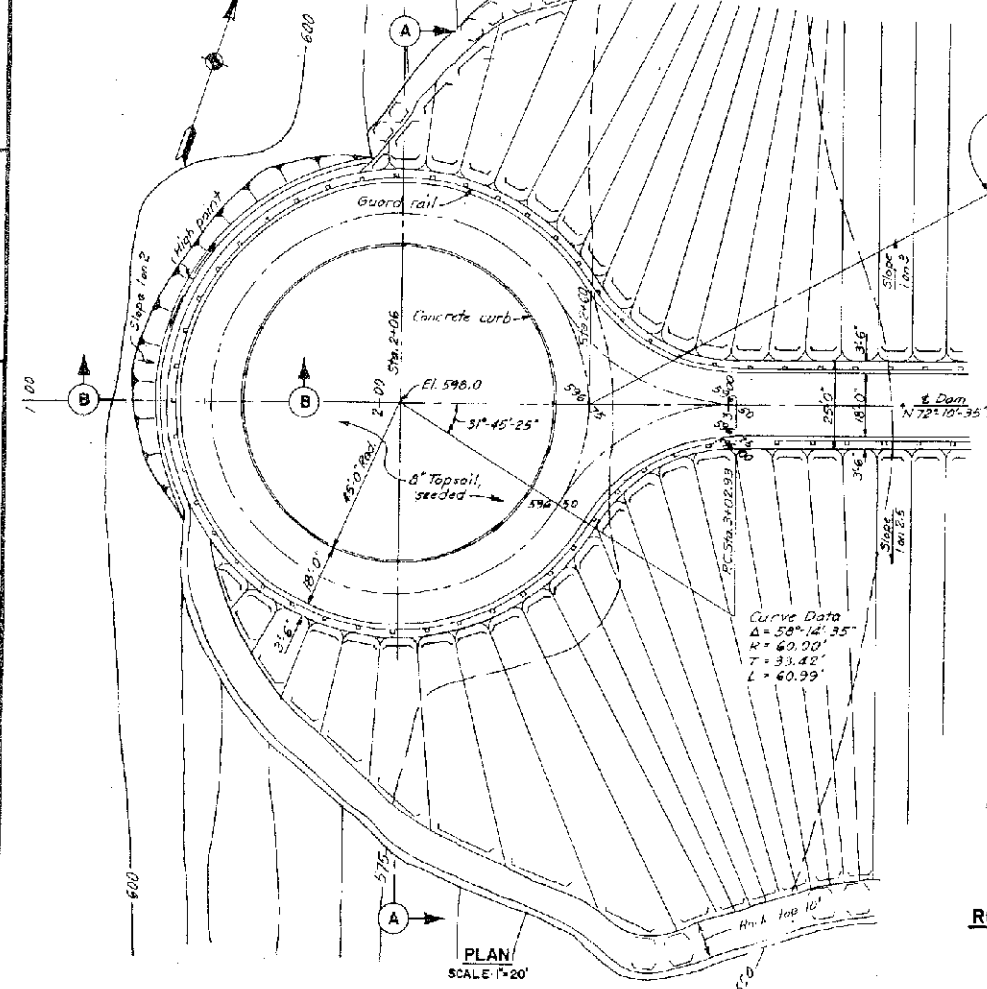
SCALE 1"=1'-0" SPEC. NO. CIV. ENG. 19-016-62-43
DRAWING NUMBER
CT-1-5733
SHEET 27

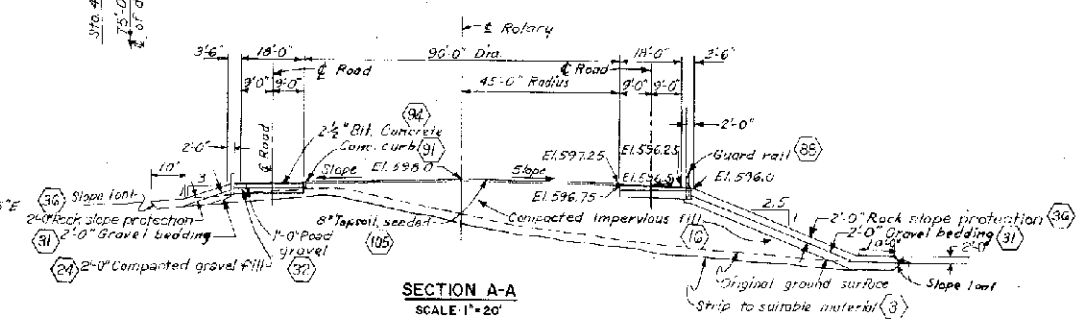
CORPS OF ENGINEERS — U.S. ARMY



PROFILE ALONG ℄ DAM & DIKE

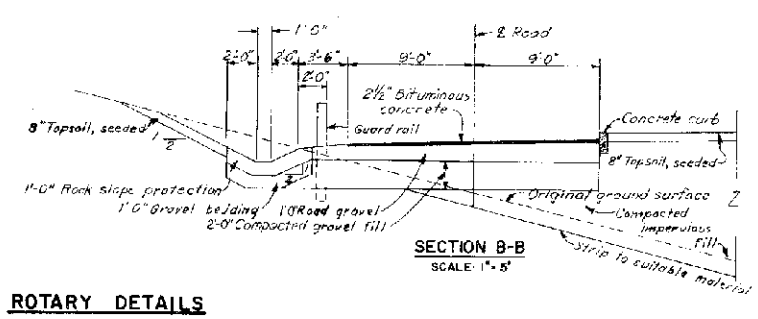
SCALE: HOR. 1"=100'
VERT. 1"=20'





SECTION A-A

SCALE: 1"=20'



SECTION B-B

SCALE: 1"=5'

ROTARY DETAILS

NOTES:

Elevations refer to mean sea level datum.
For general notes applying to this sheet, see Sh. No. 2.
For embankment sections and details, see Sh. Nos. 25 & 29
For details of guard rail, see Sh. No. 29
Figures in hexagons indicate item numbers under which payment will be made.

GRAPHIC SCALES

1" = 100' — 100' 0 100' 200'
1" = 20' — 20' 0 20' 40'
1" = 5' — 5' 0 5' 10'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY K.N.W. | DR. BY K.N.W. | CK. BY P.H.

PROJECT ENGINEER

RECOMMENDED: CHIEF, E. & H. BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM

DAM AND DIKE PROFILES
AND ROTARY DETAILS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

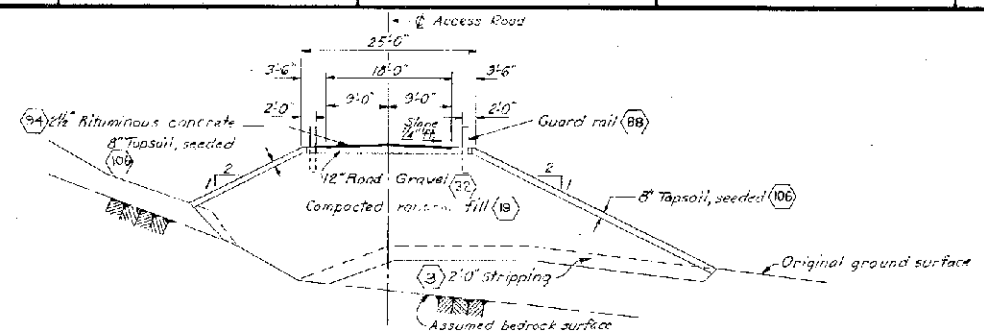
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-CHE-62-49

DRAWING NUMBER
CT-1-5734

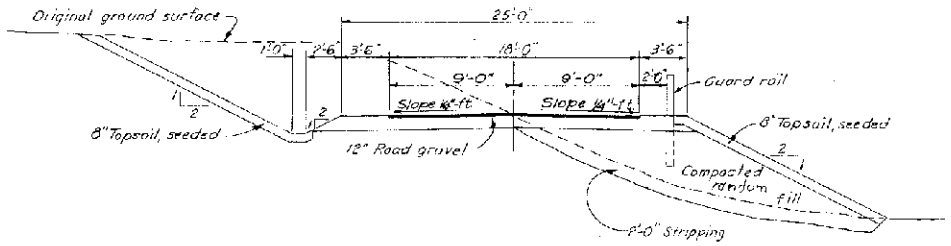
SHEET 28

MODERN BLUE PRINT CO., BOSTON, MASS.

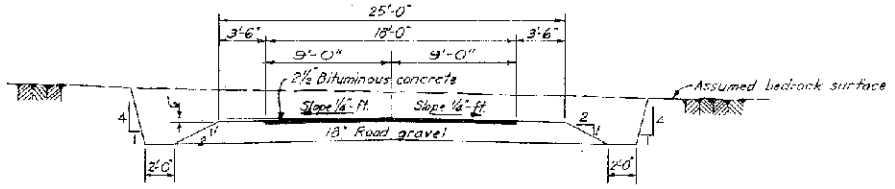
CORPS OF ENGINEERS — U. S. ARMY



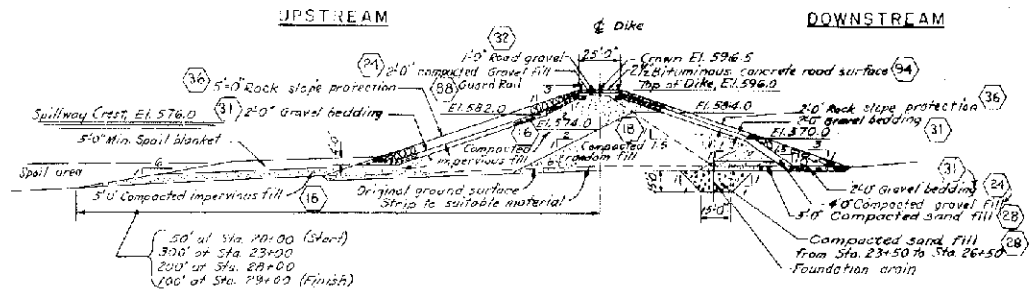
ACCESS ROAD SECTION AT STA. 16+45
SCALE: 1" = 10'



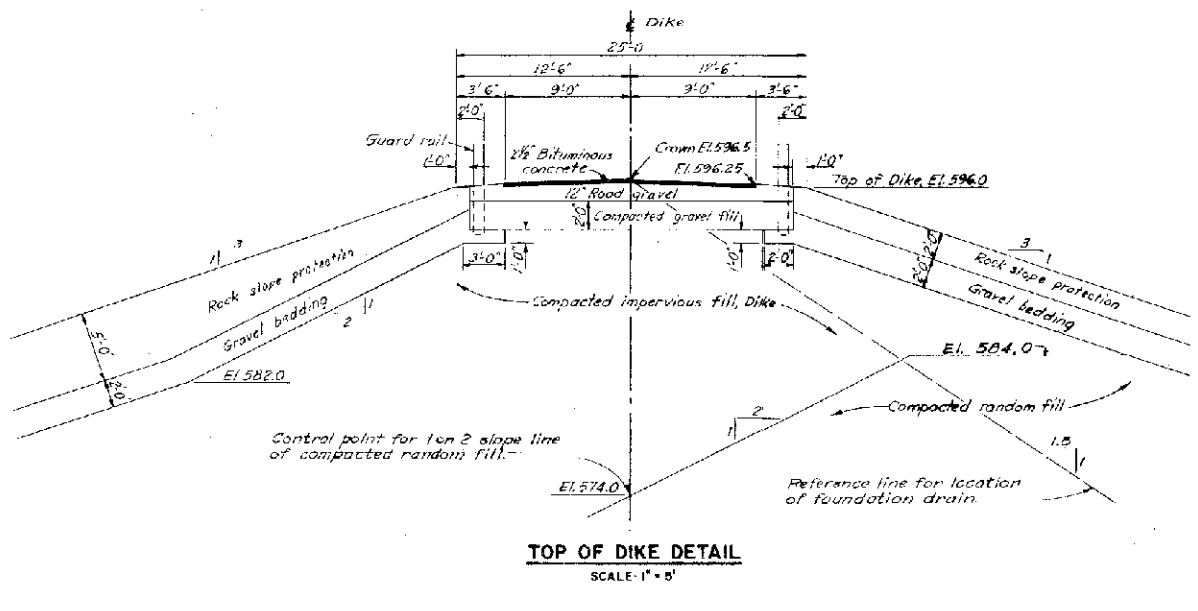
TYPICAL ACCESS ROAD SECTION
SCALE: 1" = 5'



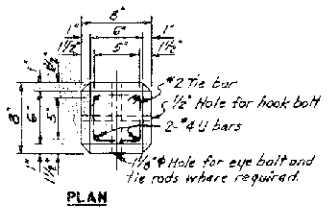
TYPICAL ACCESS ROAD SECTION IN ROCK
SCALE: 1" = 5'



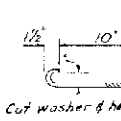
TYPICAL DIKE SECTION
SCALE 1" = 40'



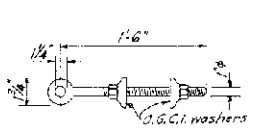
TOP OF DIKE DETAIL
SCALE: 1" = 5'



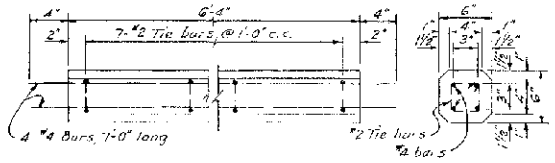
PLAN



HOOK BOLT
SCALE: 1 1/2" = 1'-0"

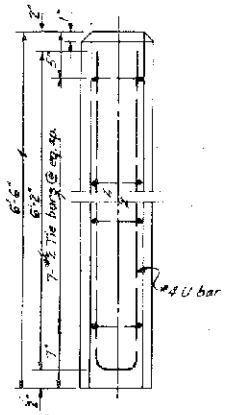


EYE BOLT
SCALE: 1 1/2" = 1'-0"



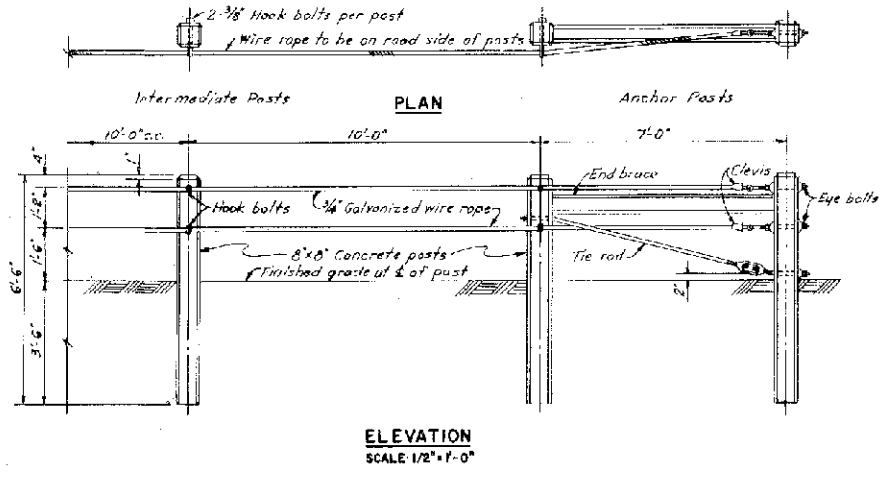
PLAN — SECTION

END BRACE
SCALE: 1 1/2" = 1'-0"

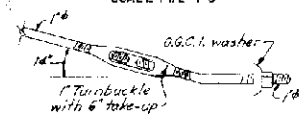


ELEVATION

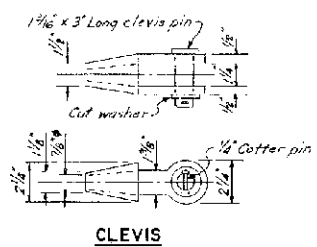
POST
SCALE: 1 1/2" = 1'-0"



ELEVATION
SCALE: 1/2" = 1'-0"



TIE ROD FITTING
SCALE: 1 1/2" = 1'-0"



CLEVIS
SCALE: 3" = 1'-0"

⑯ CABLE GUARD RAIL DETAILS

NOTES
Elevations refer to Mean Sea Level Datum.
For general notes applying to this sheet, see Sheet No. 2
Figures in hexagons indicate item numbers under which payment will be made.
For profile along center line of Access Road and Dike see Sheet No. 25.

GRAPHIC SCALES
1" = 40'
1" = 10'
1" = 5'
3" = 1'-0"
1 1/2" = 1'-0"
1/2" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.H. | DR. BY K.H.W. | CK. BY R.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
DIKE SECTIONS AND ACCESS ROAD
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

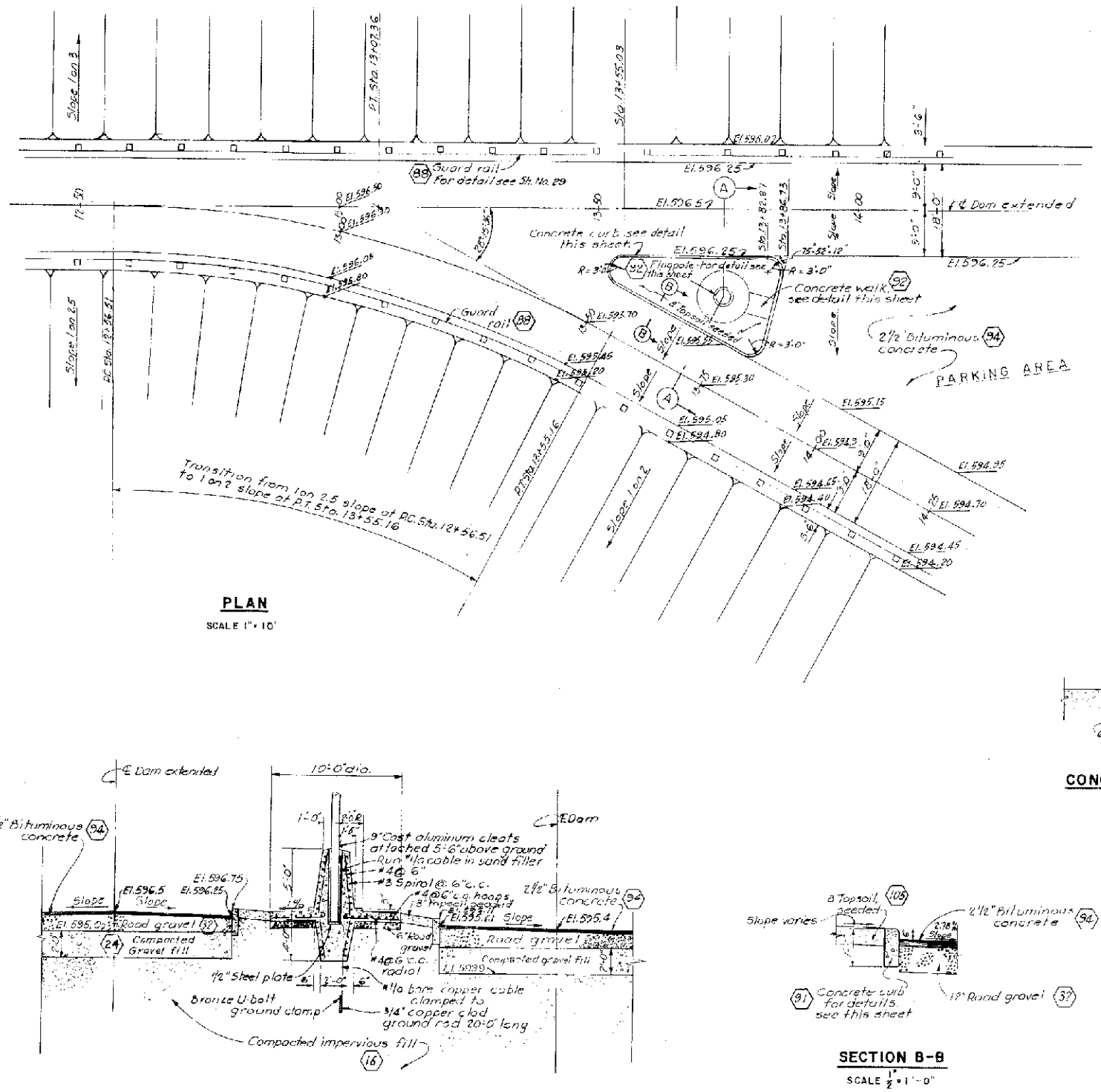
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. NB-ONE-62-54

DRAWING NUMBER
CT-1-5735

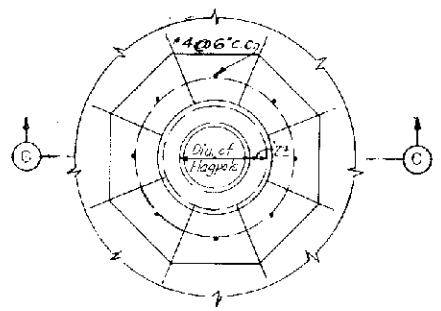
SHEET 28

CORPS OF ENGINEERS — U.S. ARMY

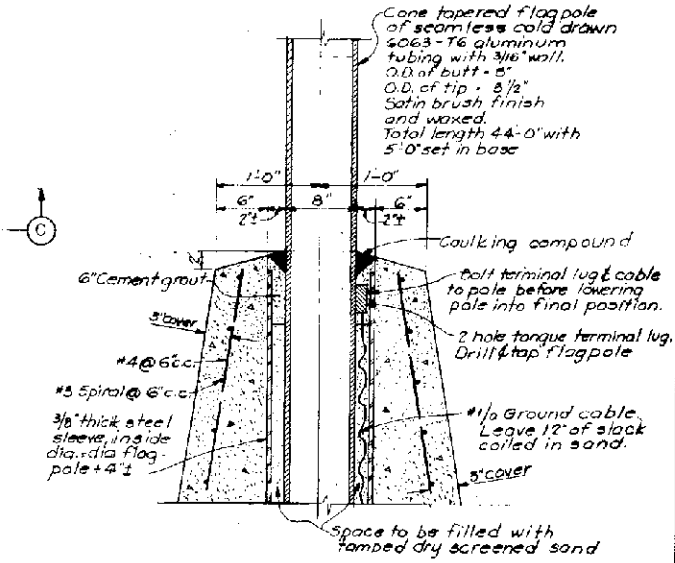


PLAN

SCALE 1" = 10'



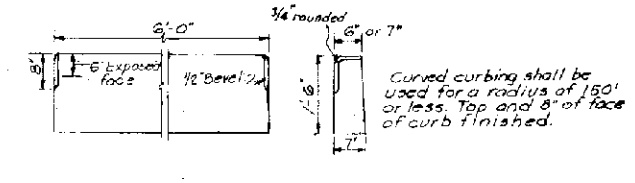
TOP PLAN



SECTION C-C

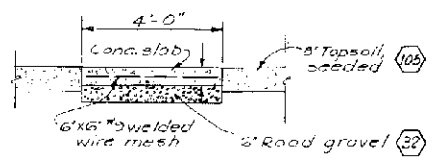
FLAGPOLE DETAILS (92)

SCALE 1½" = 1'-0"



PRE-CAST CONCRETE VERTICAL CURB (91)

NOT TO SCALE



CONCRETE WALK DETAIL (32)

SCALE 1½" = 1'-0"

SECTION A-A

SCALE ¼" = 1'-0"

SECTION B-B

SCALE ½" = 1'-0"

NOTES

For location of Parking Area see Sheet No. 36.
Figures in hexagons indicate item numbers under which payment will be made.

GRAPHIC SCALES

1" = 10'-0" 10' 0 10' 20'

1/4" = 1'-0" 4' 0 4' 8'

1/2" = 1'-0" 2' 0 2' 4' 6'

1 1/2" = 1'-0" 2' 0 6' 12'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
R.H.	A.J.H.	J.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM

PARKING AREA AND FLAG POLE DETAILS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED — CHIEF, E & D BRANCH

APPROVED — CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE AS SHOWN

SPEC. NO. CIV. ENG. 19-016-62-45

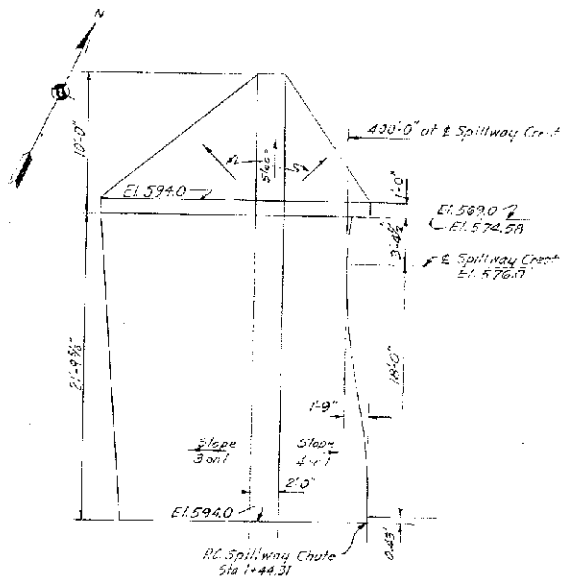
DRAWING NUMBER
CT-1-5736

SHEET 30

MODERN BLUE PRINT CO., BOSTON, MASS.

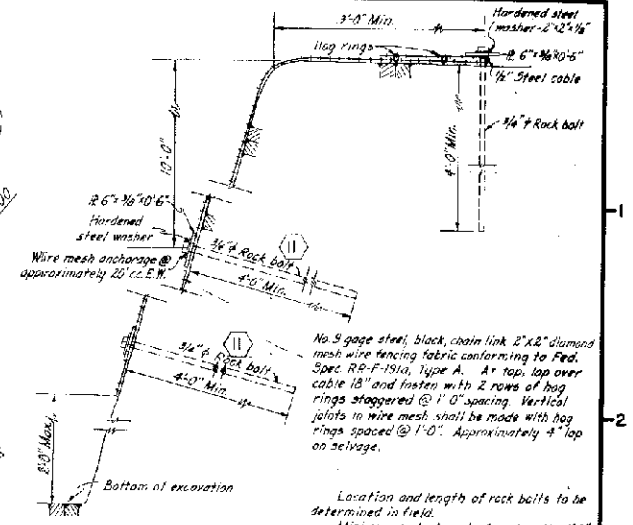
CORPS OF ENGINEERS

U.S. ARMY



DETAIL "X"
SCALE 1" = 5'-0"

PLAN
SCALE 1" = 40'



No. 9 gage steel, black, chain link 2"x2" diamond mesh wire fencing fabric conforming to Fed. Spec. RR-F-191d, Type A. 4" top, top over cable 18" and fasten with 2 rows of hog rings staggered @ 1'-0" spacing. Vertical joints in wire mesh shall be made with hog rings spaced @ 1'-0". Approximately 4" lap on selvage.

Location and length of rock bolts to be determined in field. Minimum embedment of rock bolts, 8'-0".

CHAIN LINK WIRE SAFETY MESH (II)
SLOPE PROTECTION
SCALE: 1" = 1'-0"

GRAPHIC SCALES
1" = 40'
1" = 1'-0"

NOTES:

Elevations refer to Mean Sea Level Datum.
For embankment sections, see Sheet No. 25.
For profile along ℄ of spillway channel and channel sections, see Sheet No. 32.
Figures in hexagons indicate item numbers under which payment will be made.
Coordinates are based on a local grid. Origin is county bound at intersection of Hampden and Hampshire Counties and is designated as N 50,000 - E 50,000
For maintenance road sections, details, profile and turnaround see Sheet No. 98.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.W.L.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, ENGR BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

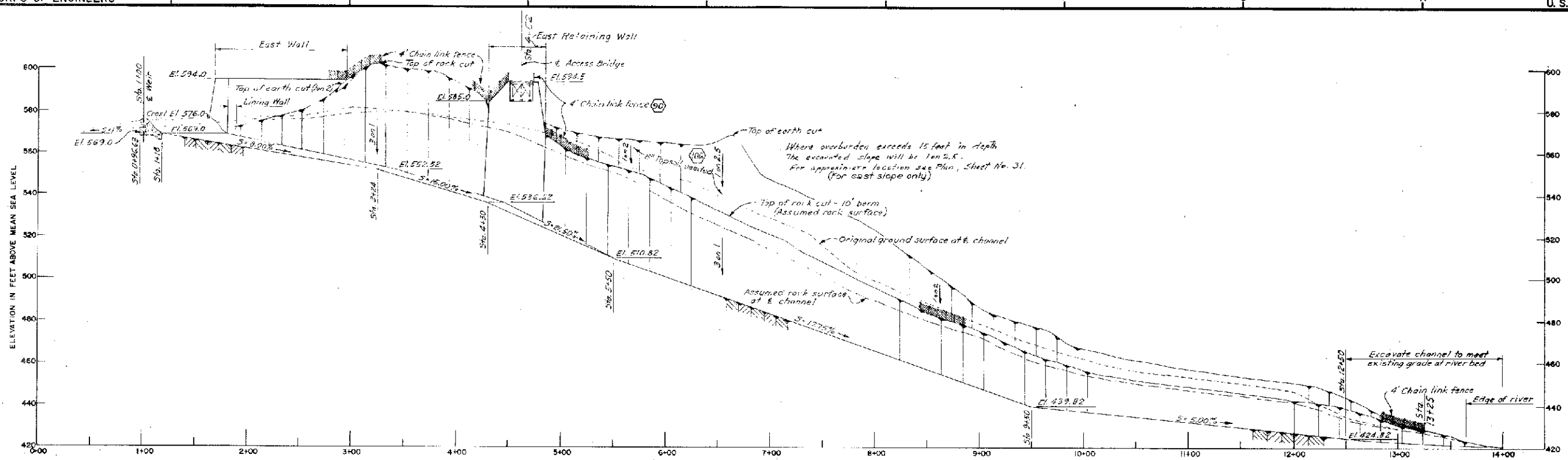
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 9-016-62-49

DRAWING NUMBER
CT-1-5737

SHEET 31

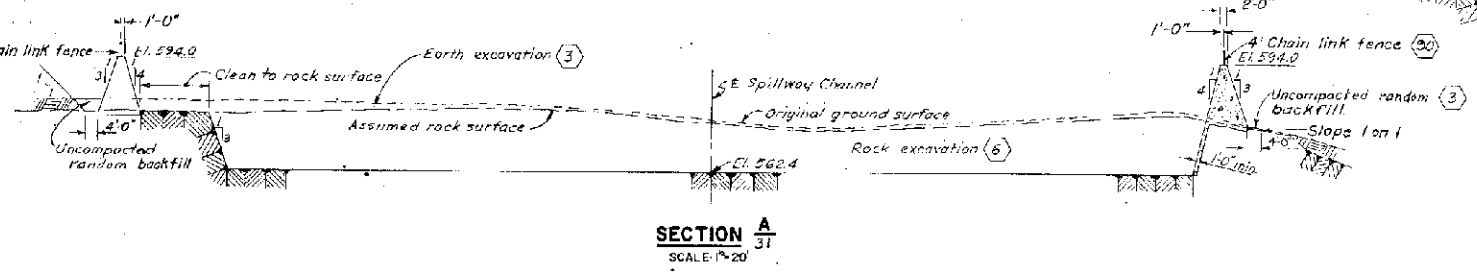
CORPS OF ENGINEERS

U. S. ARMY



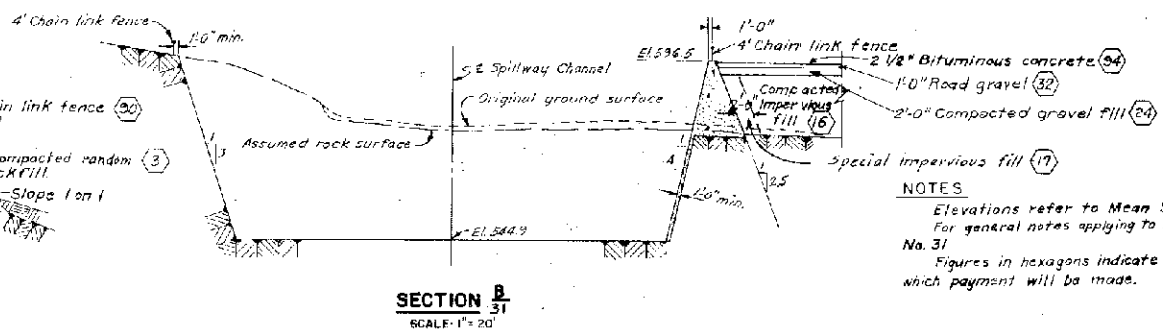
PROFILE ALONG ℄ CHANNEL

SCALE: HOR. 1"= 40'
VERT. 1"= 20'



SECTION A/31

SCALE: 1"= 20'



SECTION B/31

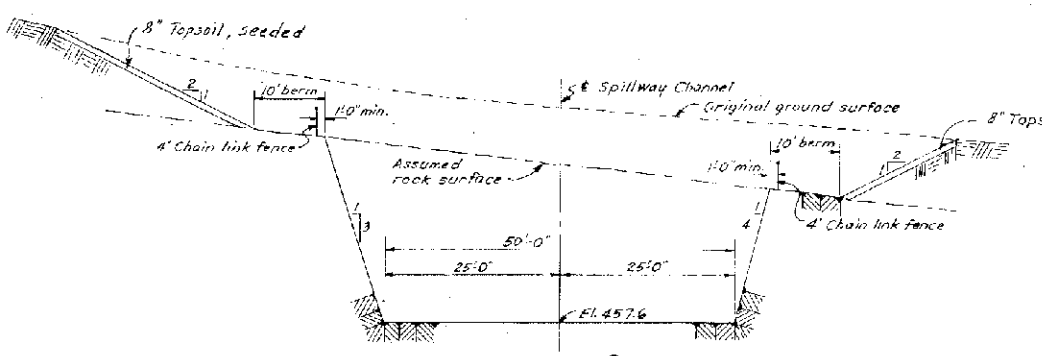
SCALE: 1"= 20'

NOTES

Elevations refer to Mean Sea Level Datum.

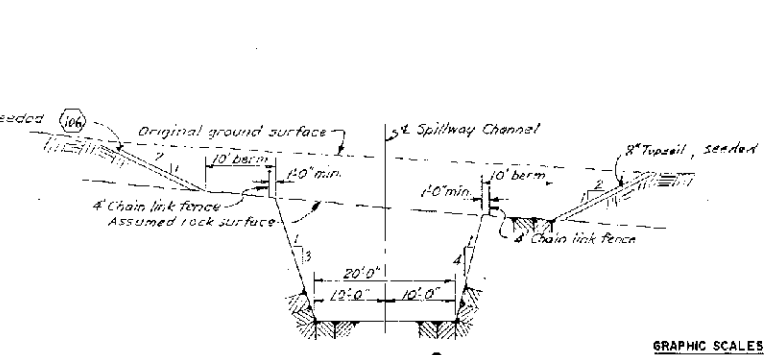
For general notes applying to this sheet, see Sheet No. 31.

Figures in hexagons indicate item numbers under which payment will be made.



SECTION C/31

SCALE 1"= 10'



SECTION D/31

SCALE 1"= 10'

GRAPHIC SCALES

1"= 10' 10' 0 10' 20'

1"= 20' 20' 0 20' 40'

1"= 40' 40' 0 40' 80'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B	K.H.W	P.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED

APPROVED

DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
PROFILE AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

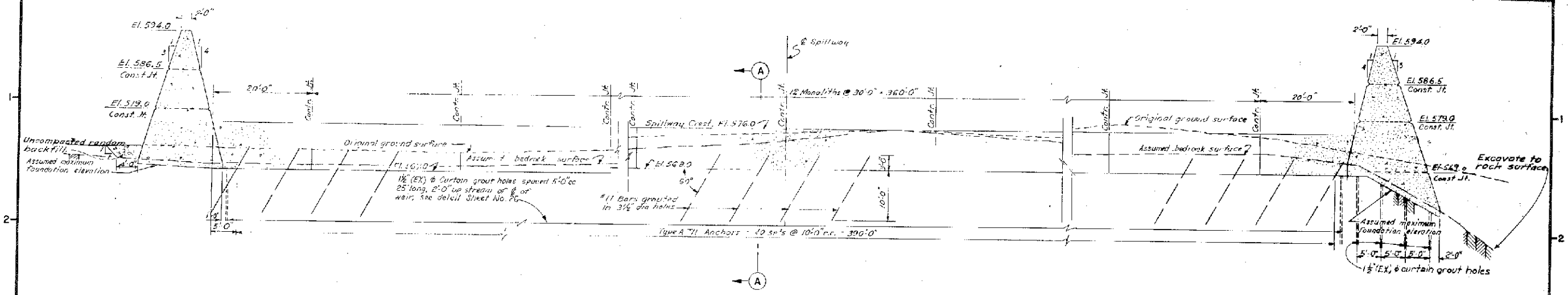
SCALE AS SHOWN | SPEC. NO. CIV. ENG. (9-016-62)-45

DRAWING NUMBER
CT-1-5738

SHEET 32

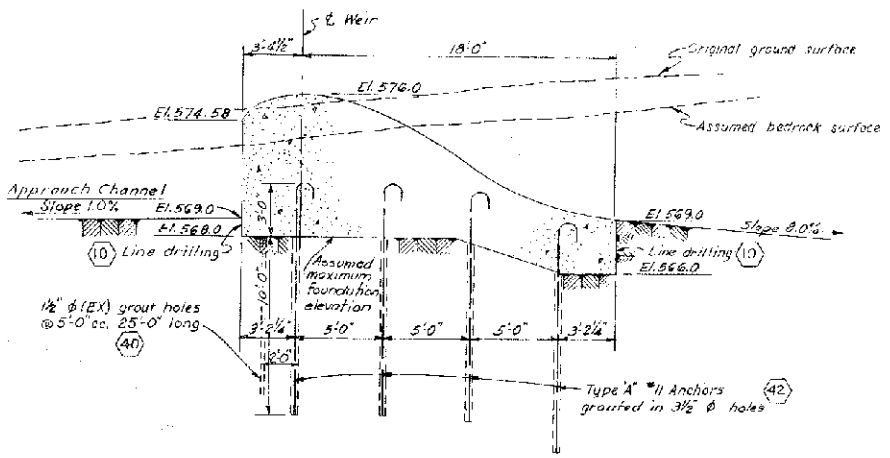
CORPS OF ENGINEERS

U.S. ARMY



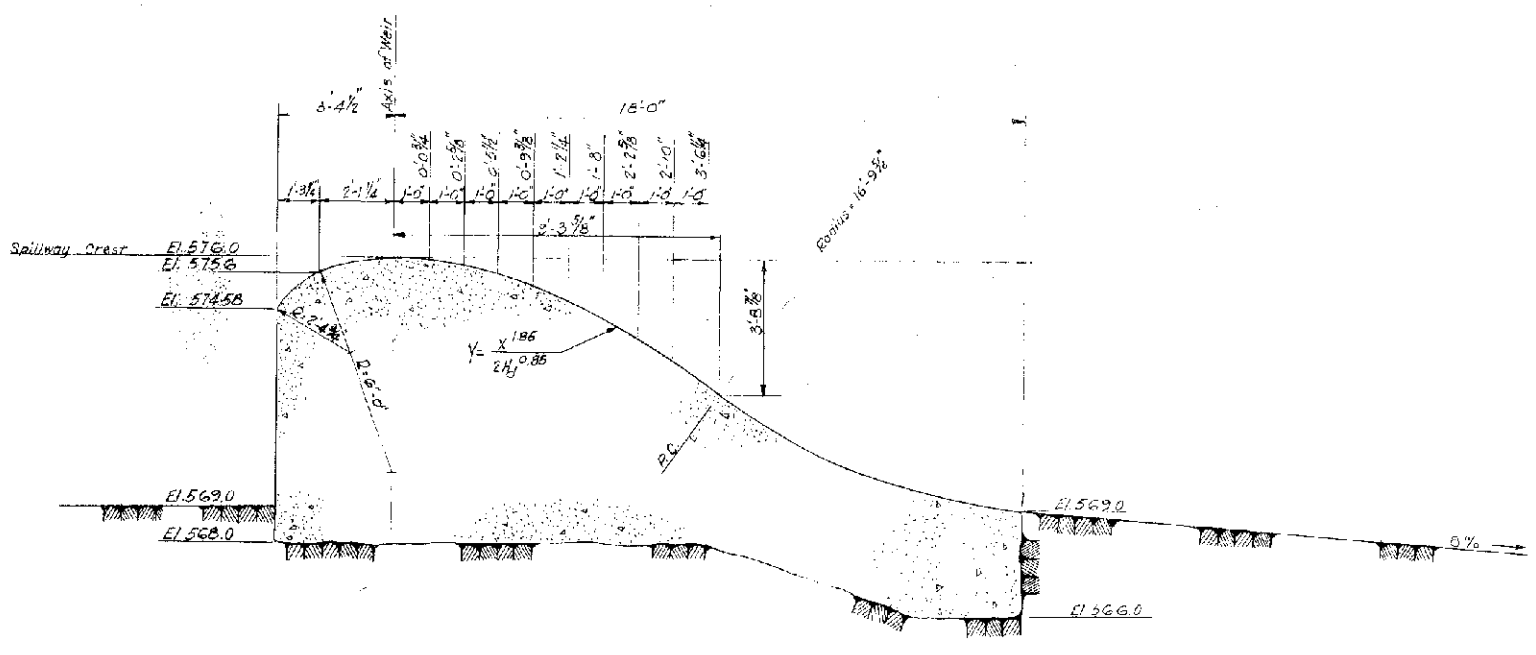
SECTION ALONG ℄ SPILLWAY WEIR

SCALE: 1/8" = 1'-0"



SECTION A-A

SCALE: 1/4" = 1'-0"



SPILLWAY WEIR CURVATURE

SCALE ½" = 1'-0"

NOTES

All elevations refer to Mean Sea Level Datum.
Concrete in spillway weir will be paid for under Item No.47.
Concrete in retaining walls will be paid for under Item No.45.
For general notes see Sheet No. 31
For structural joint detail see Sheet No. 34
Figures in hexagons indicate item numbers under which payment will be made.

GRAPHIC SCALES

1/8" = 1'-0"
1/4" = 1'-0"
1/2" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	R.W.

PROJECT ENGINEER

APPROVED RECOMMENDED

CHIEF, E & D BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
WEIR SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED DATE MARCH 1962

CHIEF, ENGINEERING DIVISION

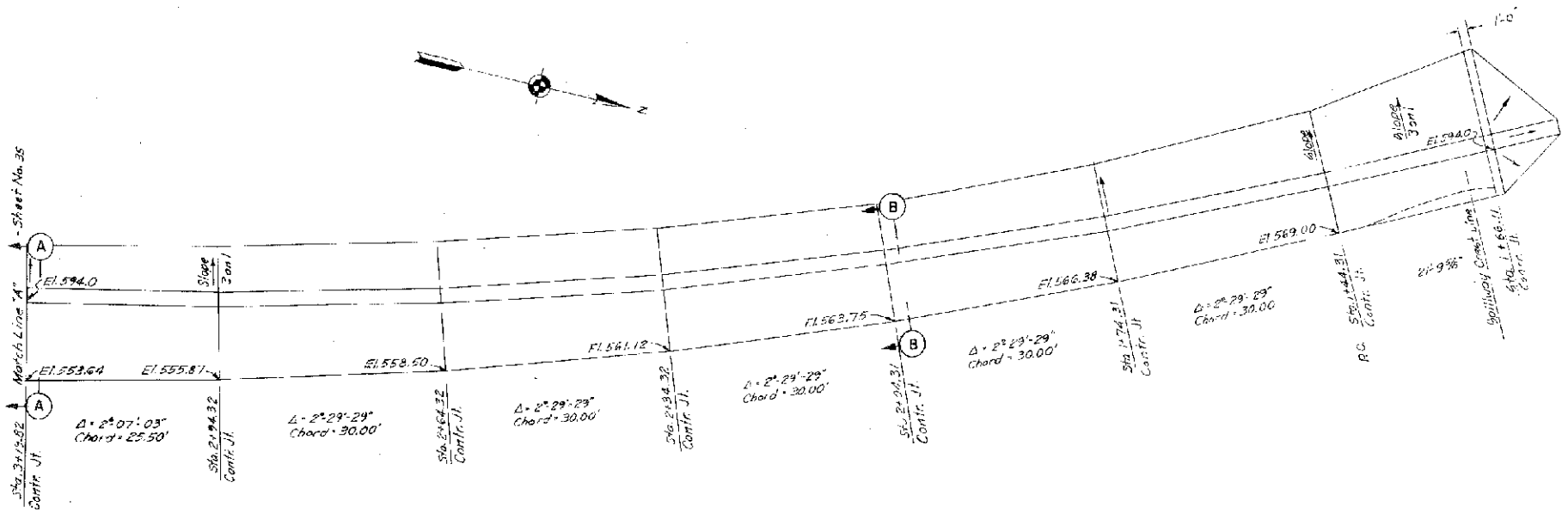
SCALE-AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5739

SHEET 33

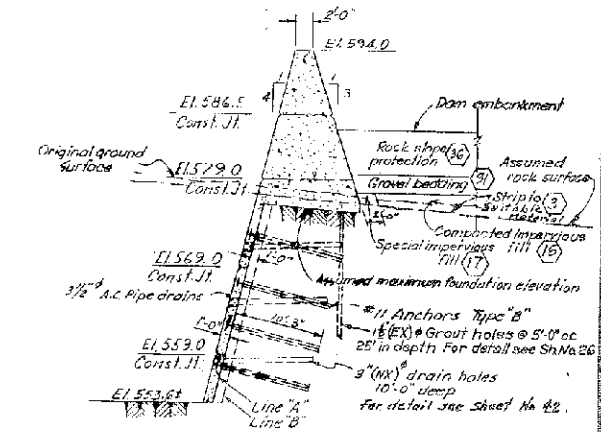
CORPS OF ENGINEERS

U.S. ARMY



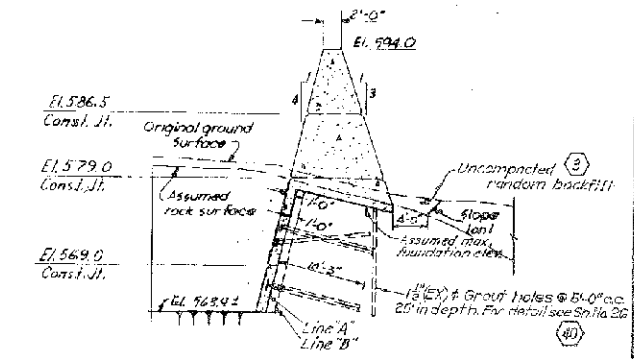
PLAN (CONTINUED)

SCALE: 1/8"=1'-0"



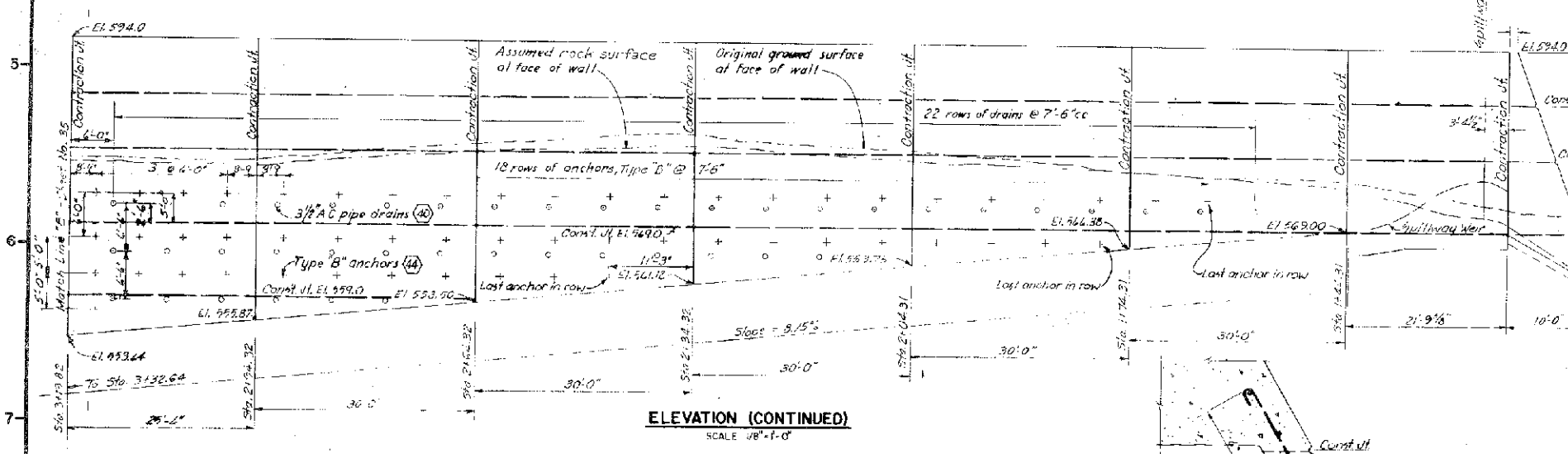
SECTION A-A

SCALE: 1/8"=1'-0"



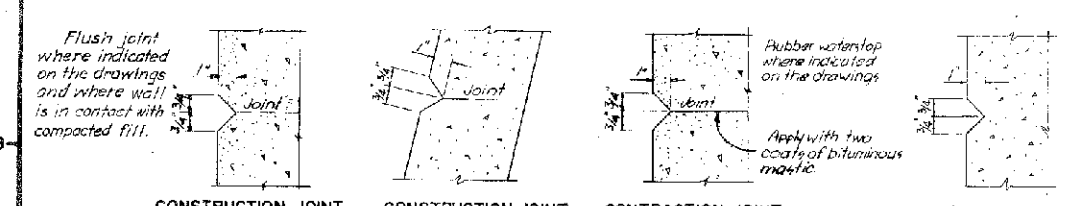
SECTION B-B

SCALE 1/8"=1'-0"



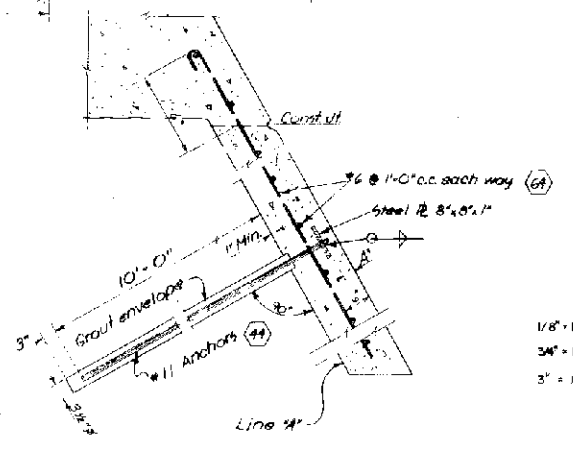
ELEVATION (CONTINUED)

SCALE 1/8"=1'-0"



STRUCTURAL JOINT DETAILS

SCALE 3"=1'-0"



TYPICAL TYPE "B" ANCHOR BAR & REINFORCEMENT DETAIL

SCALE 3/4"=1'-0"

GRAPHIC SCALE

1/8"=1'-0"
3/4"=1'-0"
3"=1'-0"

NOTES

Figures in hexagons denote item numbers under which payment will be made.
All concrete in Retaining Walls will be paid for under Item No.45
All concrete in Channel Lining will be paid for under Item No.46
For details of Structural Joints see this Sheet.
For details of Chain Link Fencing see Sheet No. 87
Line "A" indicates the minimum thickness of concrete.
Line "B" indicates the payment line for rock excavation and concrete.
All Channel Lining to be reinforced with #5 bars @ 1'-0" both ways, see detail this Sheet.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.M.W.	P.H.

PROJECT ENGINEER

RECOMMENDED

CHIEF, ENGINEERING DIVISION

APPROVED

DATE MARCH 1962

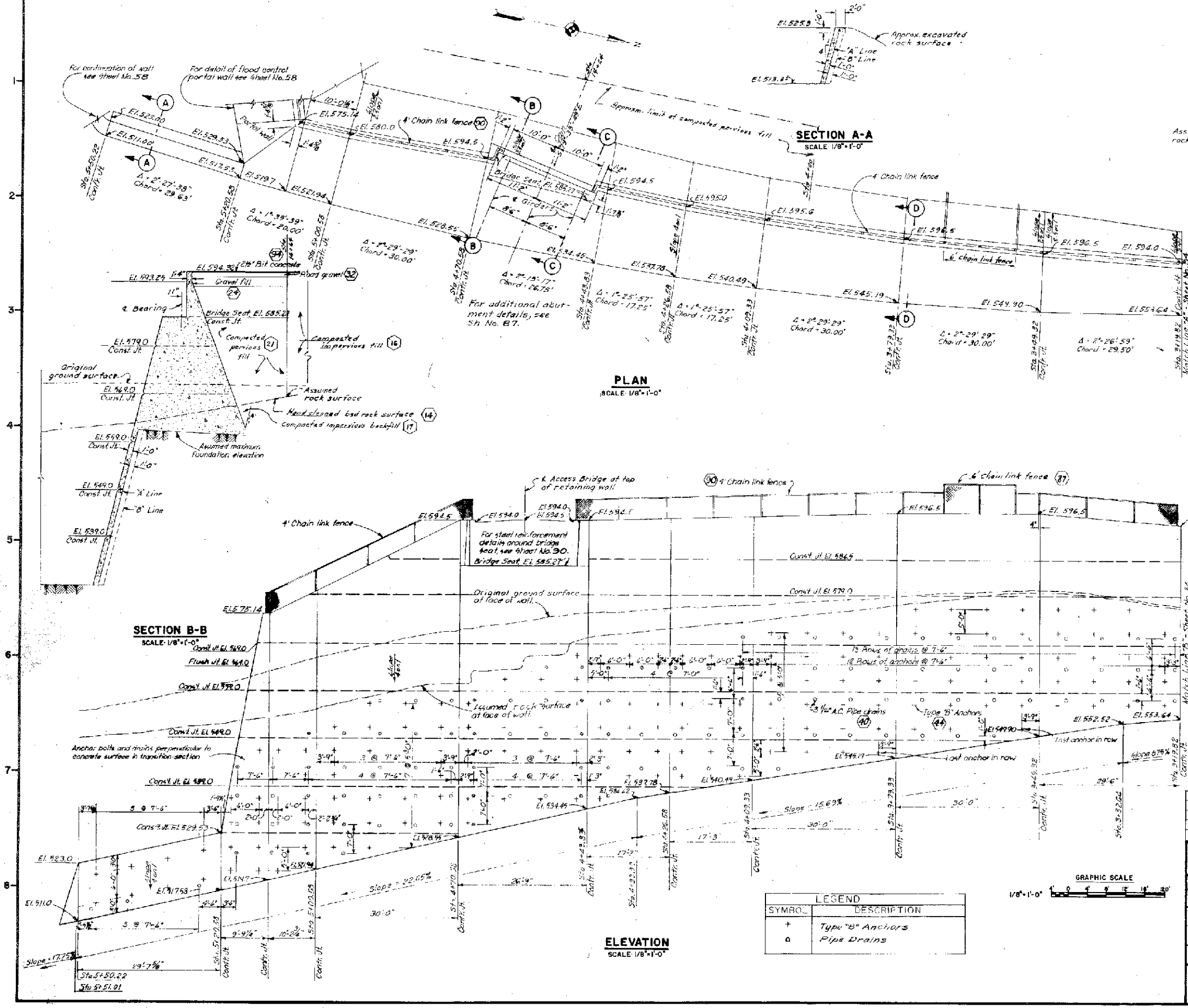
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY - WEST WALL
PLAN, ELEVATIONS AND SECTIONS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE 1/8"=1'-0" (SPEC. NO. CIV ENG. 19-016-62-42)

DRAWING NUMBER
CT-1-5740

SHEET 34

CORPS OF ENGINEERS — U.S. ARMY



SECTION A-A
SCALE: 1/8"=1'-0"

PLAN
SCALE: 1/8"=1'-0"

SECTION C-C
SCALE: 1/8"=1'-0"

SECTION B-B
SCALE: 1/8"=1'-0"

ELEVATION
SCALE: 1/8"=1'-0"

SECTION D-D
SCALE: 1/8"=1'-0"

LEGEND	
SYMBOL	DESCRIPTION
+	Type "B" Anchors
o	Pipe Drains

GRAPHIC SCALE 1/8"=1'-0"

NOTES:
1. For general notes applying to this sheet, see Sh. No. 34.
2. For details of Chain Link Fencing see Sheet No. 87.
3. All concrete in bridge abutment will be paid for under Item No. 48.
4. Where compacted impervious or random fills adjoin a wall all joints will be flush.

REV. SIGN	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. | DR. BY K.H.W. | CK. BY P.H.

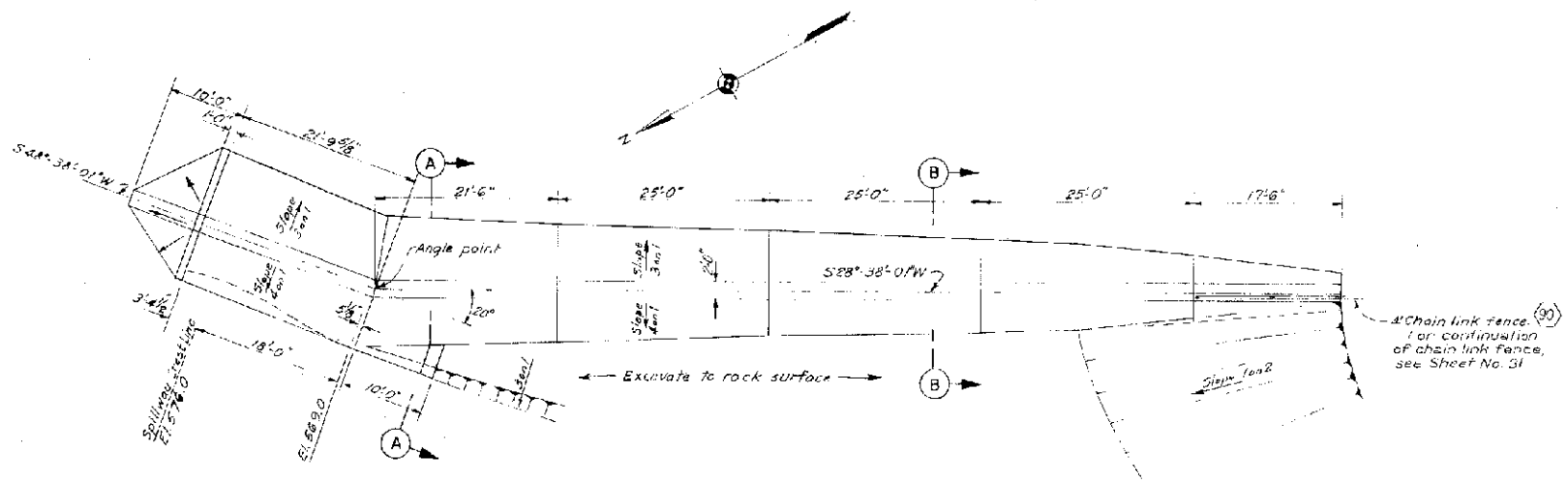
PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY WEST WALL
PLAN, ELEVATIONS AND SECTIONS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

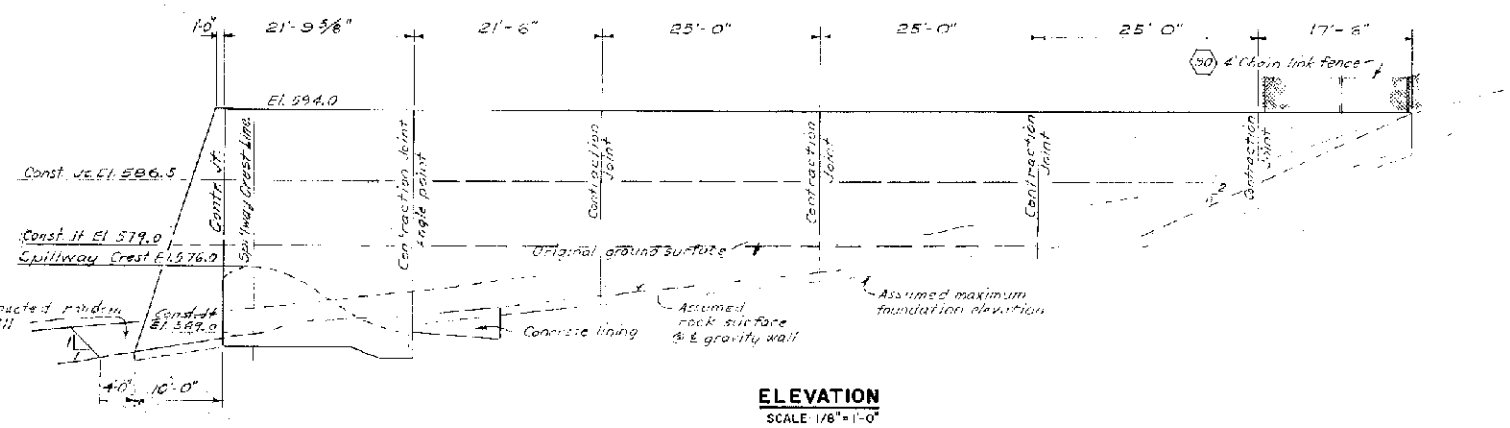
RECOMMENDED
APPROVED
DATE MARCH 1962

SCALE 1/8"=1'-0" | SPEC. NO. CIV. ENG. 15-015-62-48
DRAWING NUMBER
CT-1-5741
SHEET 35

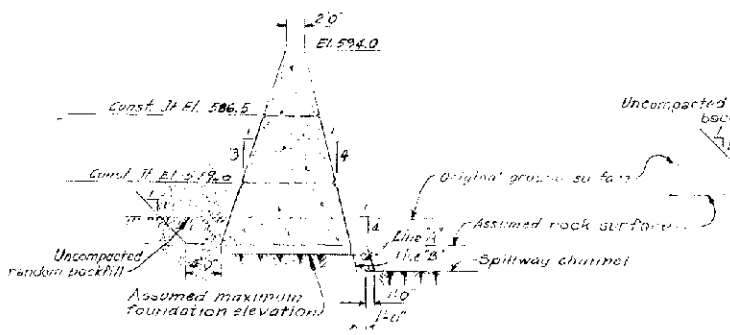
CORPS OF ENGINEERS — U. S. ARMY



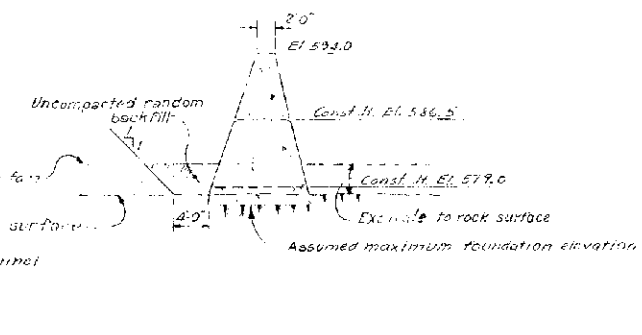
PLAN
SCALE- 1/8"=1'-0"



ELEVATION
SCALE 1/8"=1'-0"



SECTION A-A
SCALE: 1/8"=1'-0"



SECTION B-B
SCALE: 1/8"=1'-0"

NOTES-
For general notes applying to this sheet, see Sheet No. 31 and 34.
Figures in hexagons indicate item numbers under which payment will be made.
Line "A" indicates the minimum thickness of concrete.
Line "B" indicates the payment line for rock excavation and concrete.
All concrete on this sheet will be paid for under Item No. 4.5.

GRAPHIC SCALE
1/8"=1'-0" 4' 0 4' 8' 12' 16' 20'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.S.	K.H.W.	P.H.

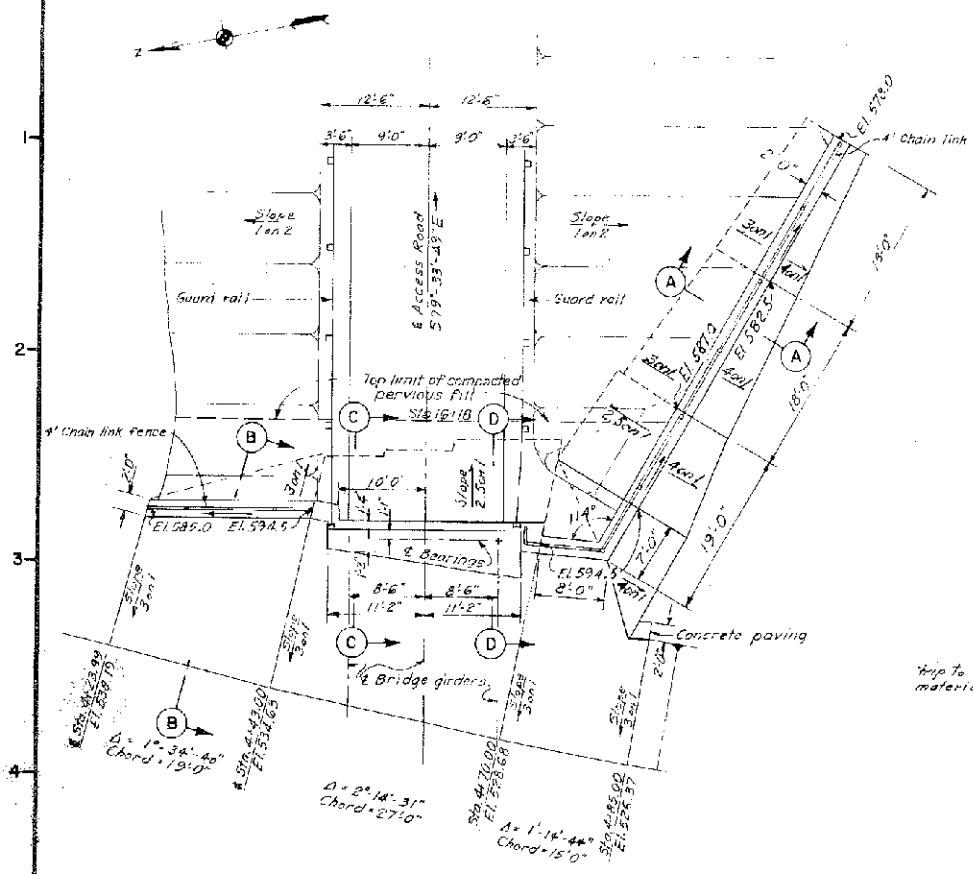
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY—EAST WALL
PLAN, ELEVATION AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED — DATE MARCH 1962

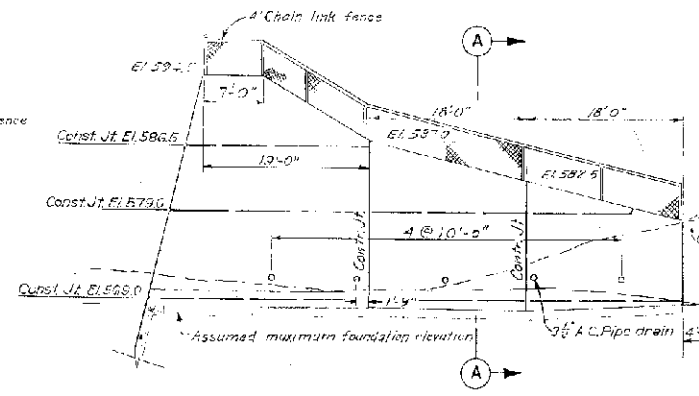
SCALE — SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER CT-I-5742
SHEET 36

CORPS OF ENGINEERS

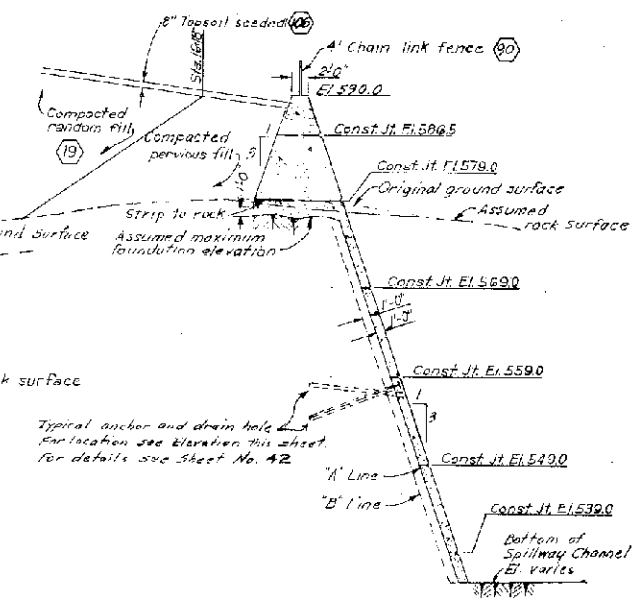
U. S. ARMY



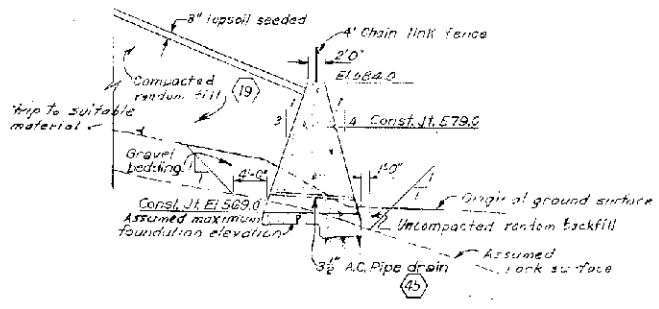
PLAN
SCALE: 1/8" = 1'-0"



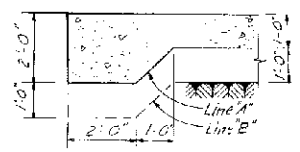
ELEVATION - SOUTH WING WALL
SCALE: 1/8" = 1'-0"



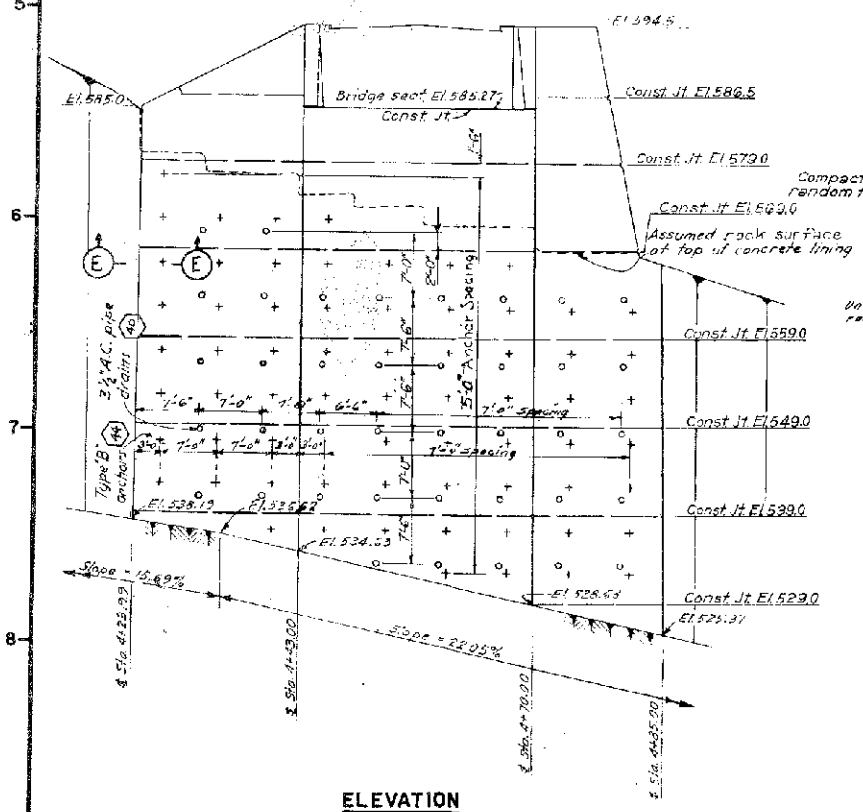
SECTION B-B
SCALE: 1/8" = 1'-0"



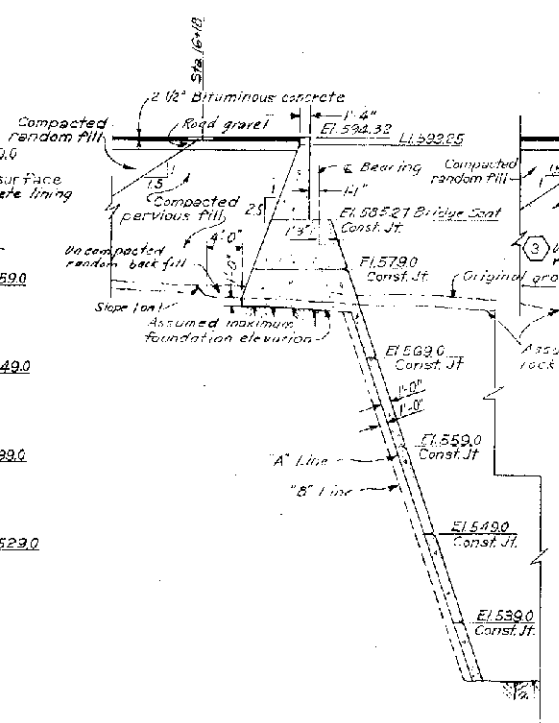
SECTION A-A
SCALE: 1/8" = 1'-0"



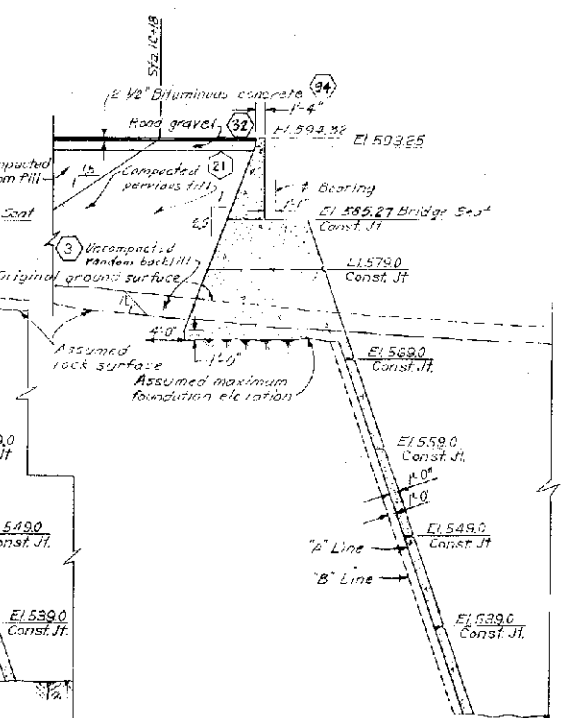
SECTION E-E
SCALE: 1/2" = 1'-0"



ELEVATION
SCALE: 1/8" = 1'-0"



SECTION C-C
SCALE: 1/8" = 1'-0"



SECTION D-D
SCALE: 1/8" = 1'-0"

GRAPHIC SCALE

1/8" = 1'-0"

1/2" = 1'-0"

NOTES

For general notes applying to this sheet, see Sheet No. 31 & 35
Figures in hexagons indicate item numbers under which payment will be made.
Line 'A' indicates the minimum thickness of concrete.
Line 'B' indicates the payment line for rock excavation and concrete.
All concrete lining to be reinforced with #6 bars, 12" c.c., both ways. For details see Sheet No. 34
Concrete in Retaining Walls will be paid for under item No. 45
Concrete in Bridge Abutment will be paid for under item No. 48
Concrete in lining will be paid for under item No. 46.
Compacted pervious fill adjacent to the back of the wall shall extend from Sta. 4+42 to intersection with south wing wall.
Gravel bedding to be placed along entire length of south wing wall.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	P.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY - EAST RETAINING WALL
PLAN, ELEVATIONS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED RECOMMENDED: Chief, Engineering Branch
APPROVED: Chief, Engineering Division
DATE: MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-018-62-49
DRAWING NUMBER
CT-1-5743
SHEET 37

CORPS OF ENGINEERS

U. S. ARMY

SECTION A-A
SCALE: 1"=20'

PLAN
SCALE: 1"=20'

PROFILE ALONG ℄
SCALE: 1"=20'

GRAPHIC SCALE
1" = 20'

NOTES:
For general notes applying to this sheet, see Sheet No. 2
Figures in hexagons indicate item numbers under which payment will be made.
Top soil and seed all earth cut slopes

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.H.H. | DR. BY K.H.W. | CK. BY P.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, ENGINEERING DIVISION

APPROVED: CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

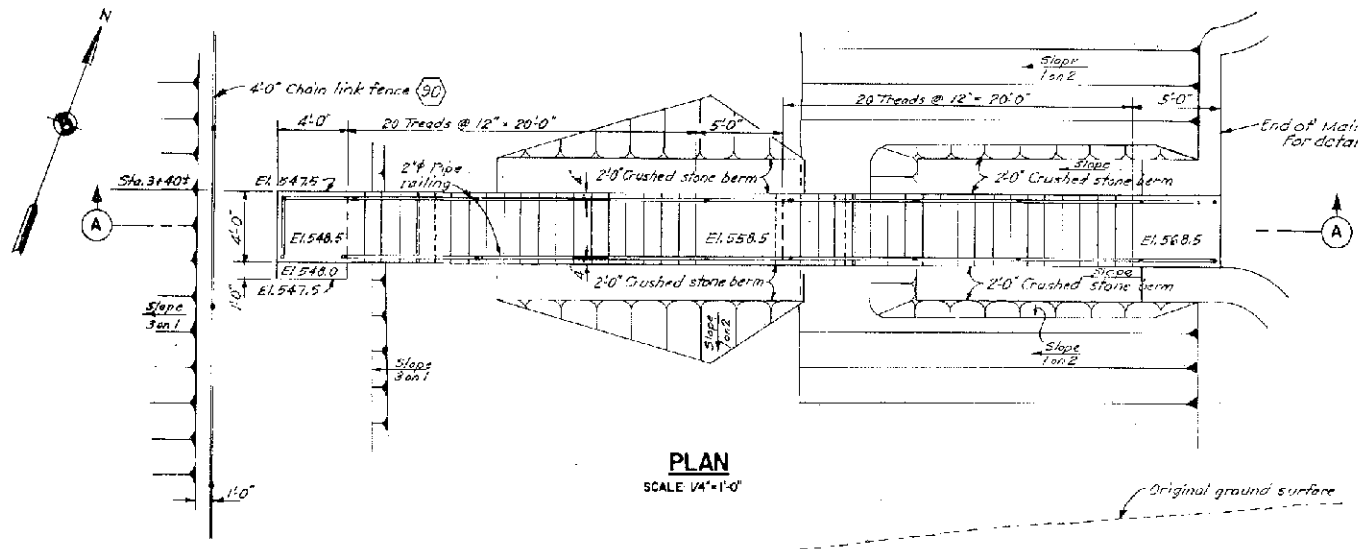
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET WORKS
PLAN AND PROFILE
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE: 1" = 20' | SPEC. NO. CIV. ENG. 19-016-62-49

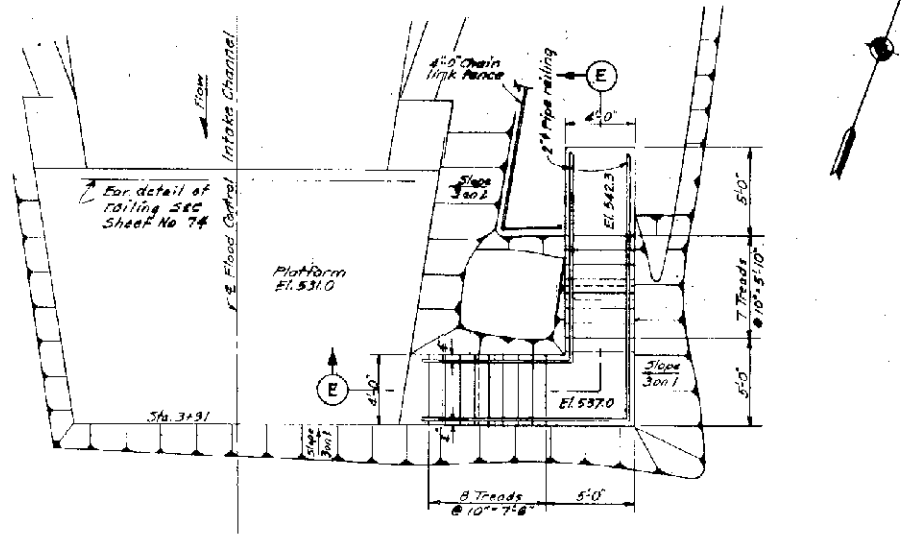
DRAWING NUMBER
CT-I-5744

SHEET 39

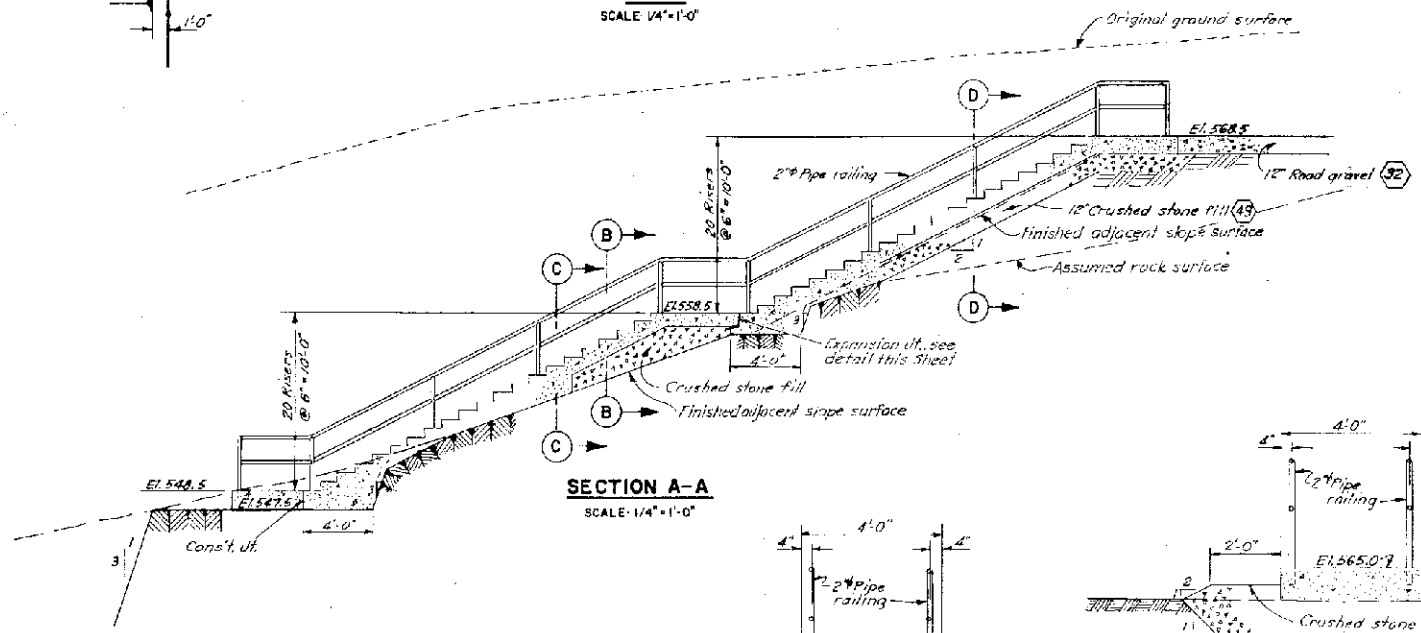
CORPS OF ENGINEERS — U.S. ARMY



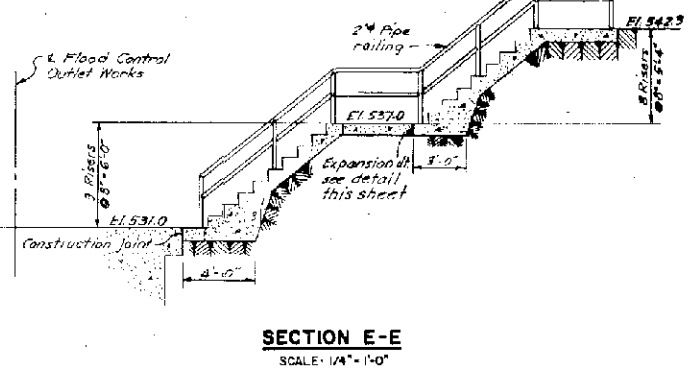
PLAN
SCALE: 1/4" = 1'-0"



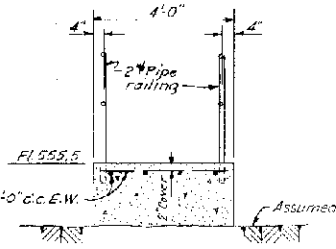
PLAN
SCALE: 1/4" = 1'-0"



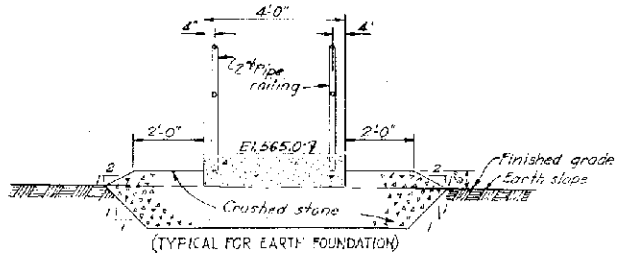
SECTION A-A
SCALE: 1/4" = 1'-0"



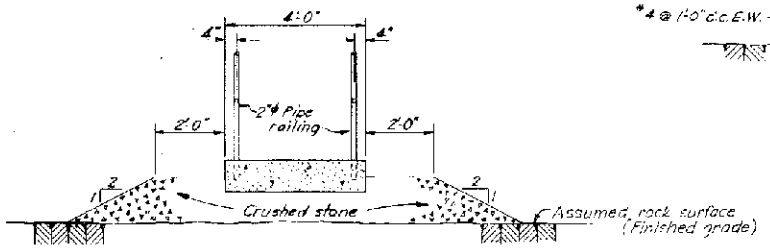
SECTION E-E
SCALE: 1/4" = 1'-0"



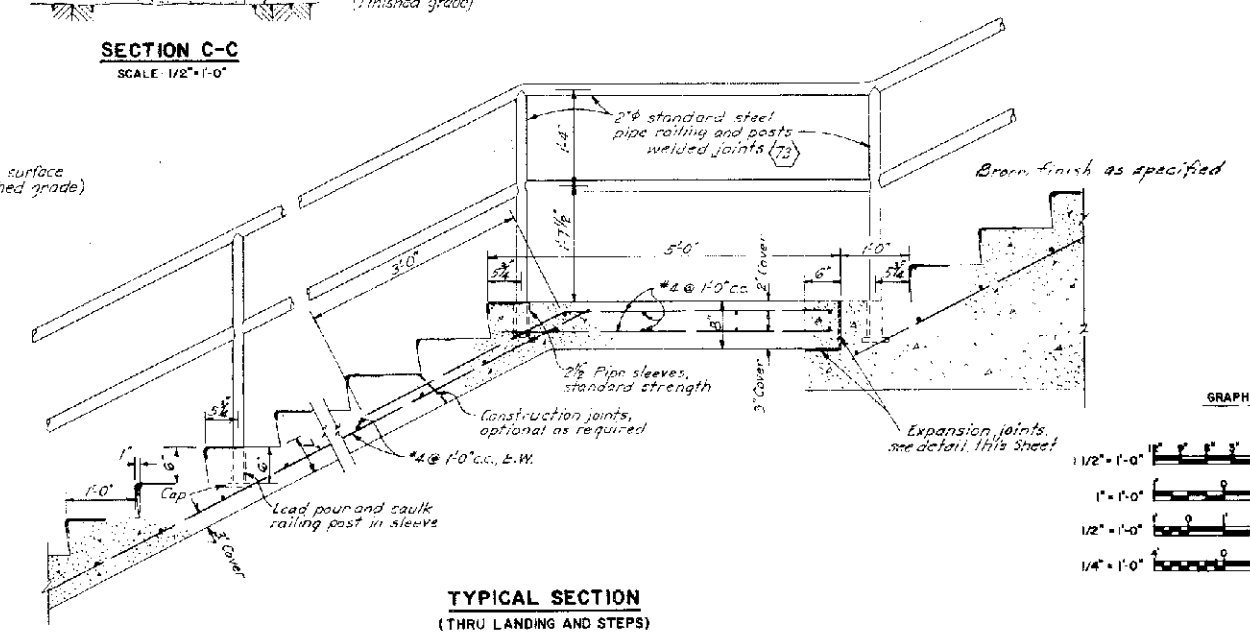
SECTION C-C
SCALE: 1/2" = 1'-0"



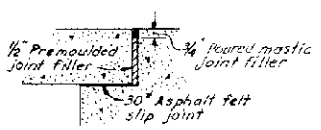
SECTION D-D
SCALE: 1/2" = 1'-0"



SECTION B-B
SCALE: 1/2" = 1'-0"



TYPICAL SECTION
(THRU LANDING AND STEPS)
SCALE: 1" = 1'-0"



EXPANSION JOINT DETAIL
SCALE: 1 1/2" = 1'-0"

NOTES

Elevations refer to Mean Sea Level Datum.
All concrete on this sheet will be paid for under Item No. 49.
All steel reinforcement will be paid for under Item No. 68.
Figures in hexagons indicate item numbers under which payment will be made.
For general location of concrete stairs see Sheet No. 38.
All stair treads and platforms shall be provided with abrasive safety treads; for details of treads and risers see Sheet No. 74

GRAPHIC SCALES

1 1/2" = 1'-0" 1" = 1'-0" 1/2" = 1'-0" 1/4" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.S. | DR. BY R.H.W. | CK. BY P.W.

PROJECT ENGINEER

RECOMMENDED: CHIEF, P. & R. BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
CONCRETE STAIRS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

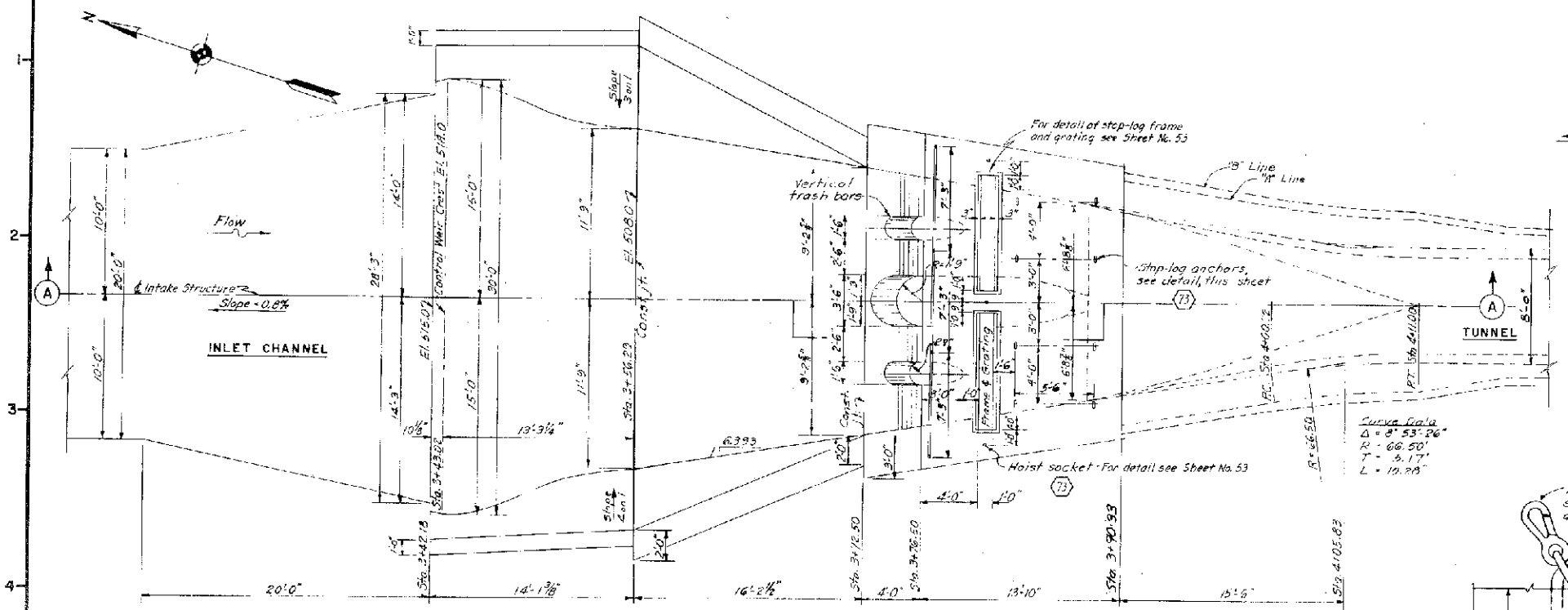
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER: CT-1-5745

SHEET 39

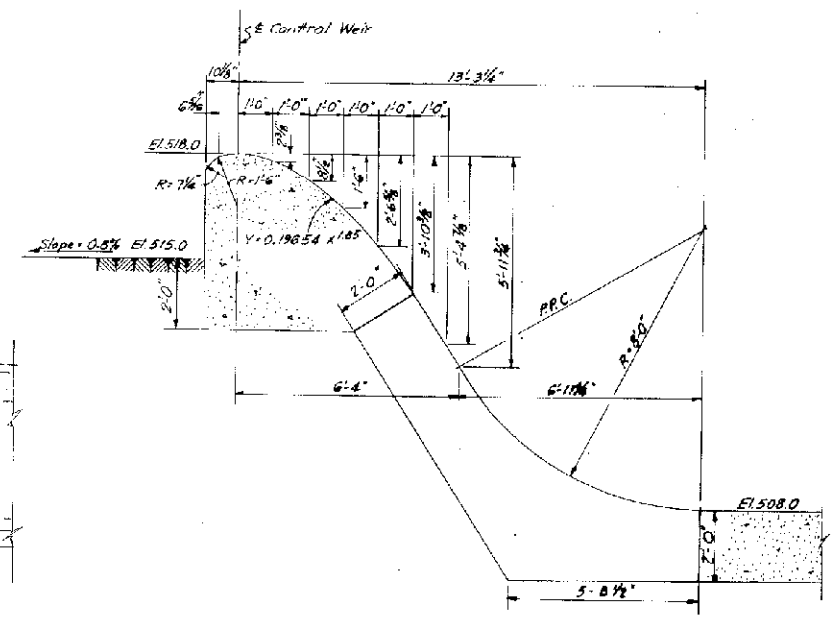
CORPS OF ENGINEERS

U. S. ARMY



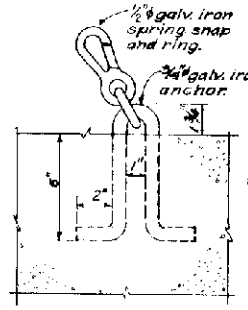
PLAN

SCALE: 1/4" = 1'-0"



FLOOD CONTROL WEIR DETAIL

SCALE: 1/2" = 1'-0"



STOP LOG ANCHOR (73)

SCALE: 3" = 1'-0"

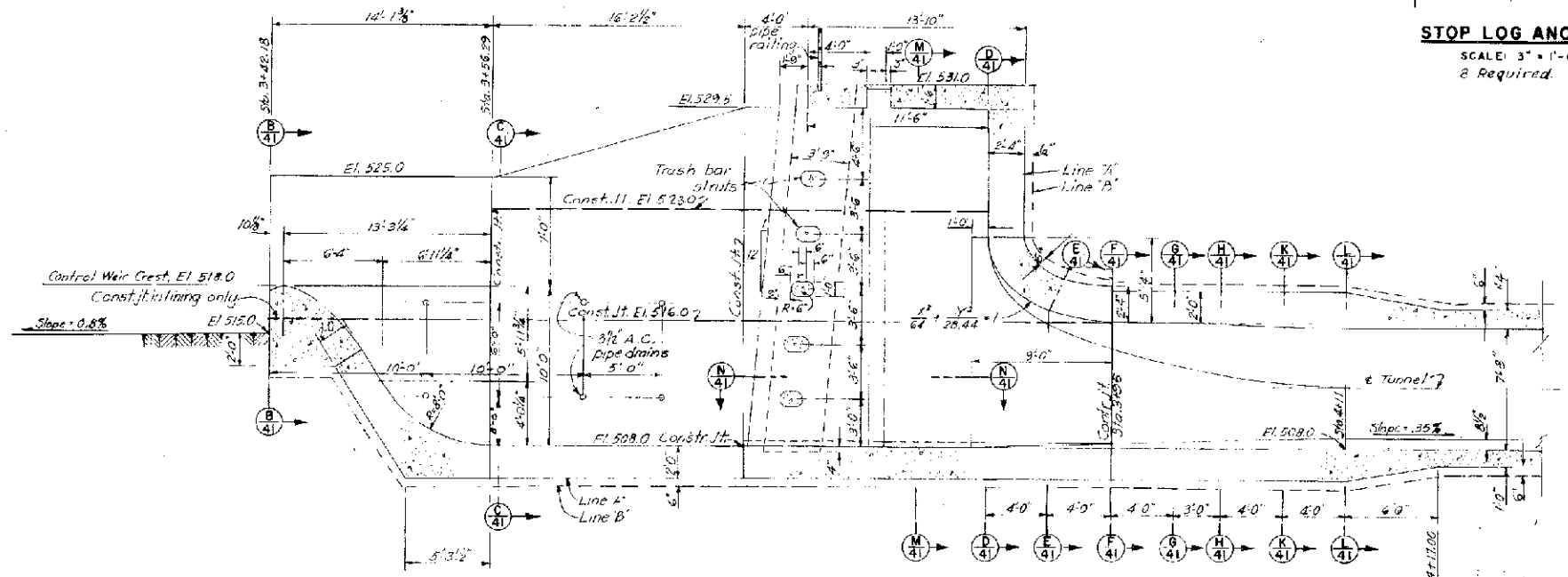
8 Required.

NOTES

Elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate item numbers under which payment will be made.
Line "A" indicates minimum thickness of concrete.
Line "B" indicates payment line for rock excavation and concrete.
All concrete from Sta. 3+42.18 to 3+96 will be paid for under Item No. 49.
All exposed edges of concrete to be formed to 1"-45°
The following details are shown on sheets listed below:

Structural Joints - Sheet No.		34
Type "A" Anchors -	"	42
" "B" " -	"	42
Pipe Railing -	"	74

All concrete from Sta. 3+96 to Sta. 4+17 will be paid for under Item No. 51



SECTION A-A

SCALE: 1/4" = 1'-0"

GRAPHIC SCALES

1/4" = 1'-0"
1/2" = 1'-0"
3" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
R.H.	K.H.W.	J.M.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
PLAN SECTION AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER
RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

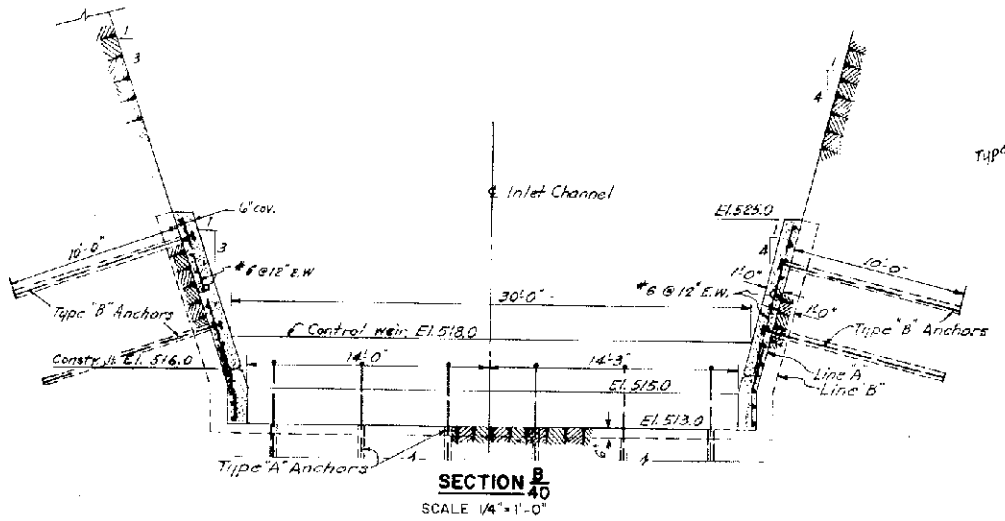
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5746

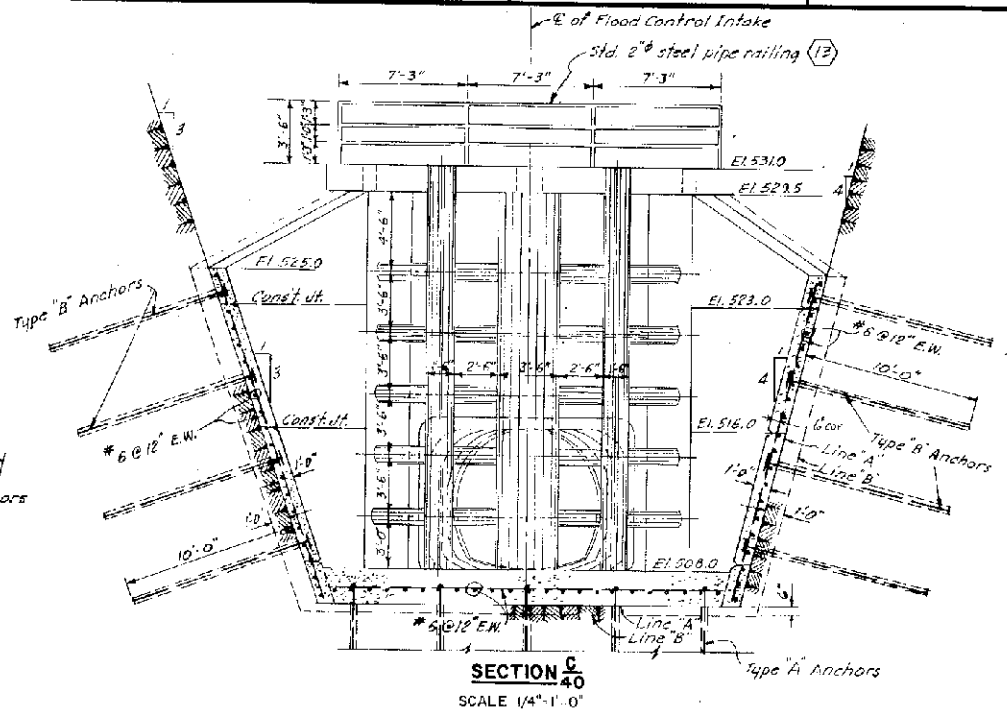
SHEET 40

CORPS OF ENGINEERS

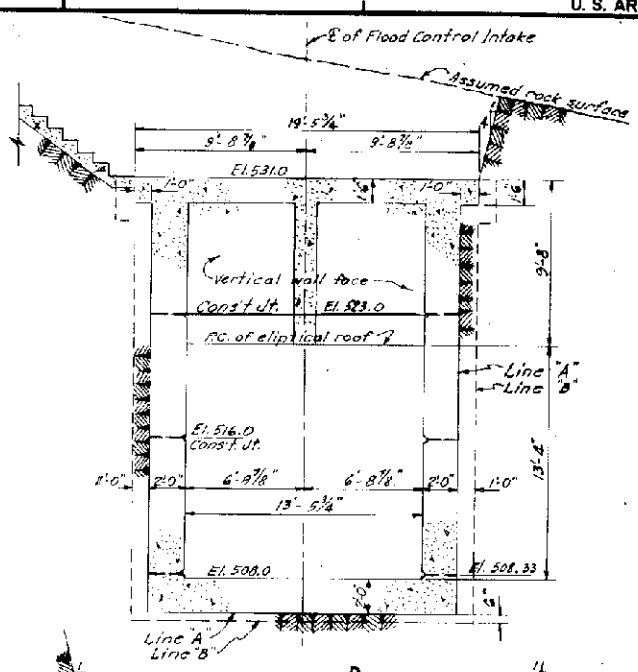
U. S. ARMY



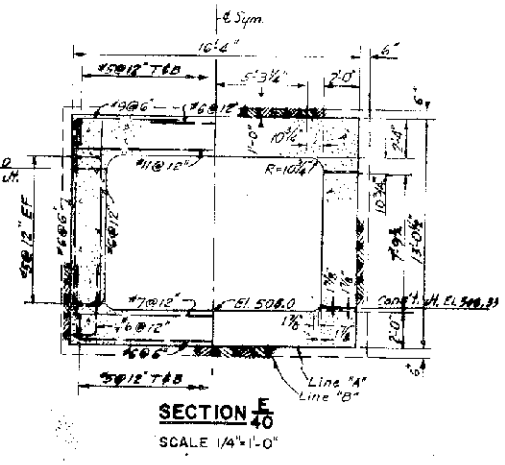
SECTION B/40
SCALE 1/4"=1'-0"



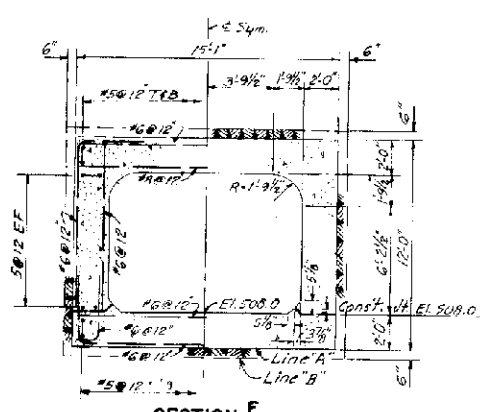
SECTION C/40
SCALE 1/4"=1'-0"



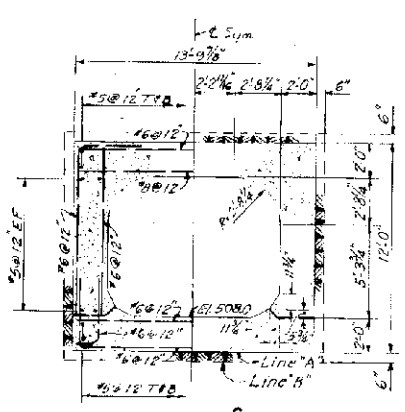
SECTION D/40
SCALE 1/4"=1'-0"



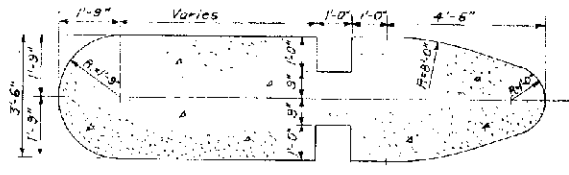
SECTION E/40
SCALE 1/4"=1'-0"



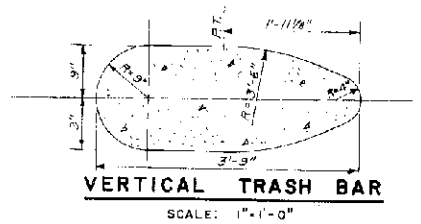
SECTION F/40
SCALE 1/4"=1'-0"



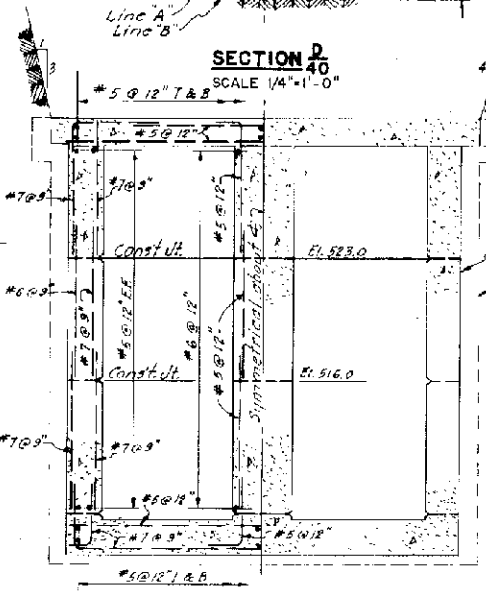
SECTION G/40
SCALE 1/4"=1'-0"



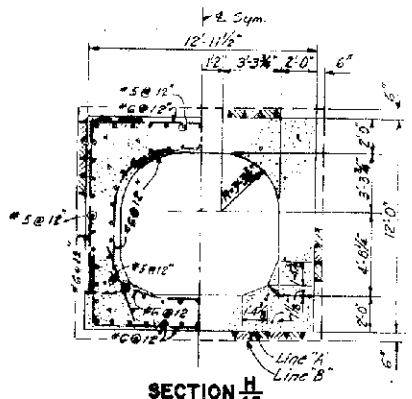
SECTION N/40
SCALE: 1/2"=1'-0"



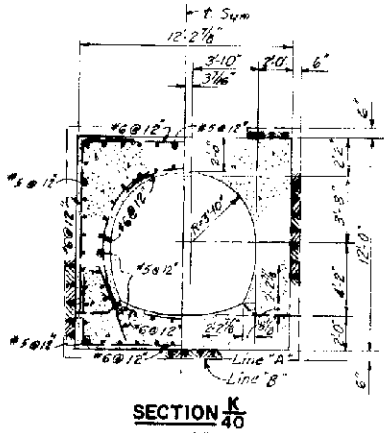
VERTICAL TRASH BAR
SCALE: 1"=1'-0"



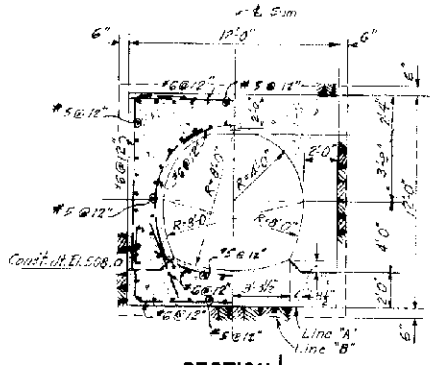
SECTION M/40
SCALE 1/4"=1'-0"



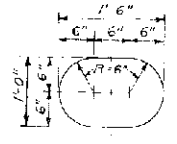
SECTION H/40
SCALE 1/4"=1'-0"



SECTION K/40
SCALE 1/4"=1'-0"



SECTION L/40
SCALE 1/4"=1'-0"



TRASH BAR STRUT
SCALE: 1"=1'-0"

GRAPHIC SCALES

1/4"=1'-0" 0 4' 8'

1/2"=1'-0" 0 1' 2' 3' 4' 5'

1"=1'-0" 0 1' 2'

NOTES

For general notes applying to this Sheet see Sheet Nos. 40 & 43
Figures in hexagons indicate item numbers under which payment will be made.
Line "A" indicates minimum thickness of concrete
Line "B" indicates payment line for rock excavation and concrete
All steel reinforcement will be paid for under Item No. 24.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P.H.	K.H.K.	J.R.

PROJECT ENGINEER

APPROVED

CHIEF, E. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
SECTIONS & REINFORCING DETAILS NO. I
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED

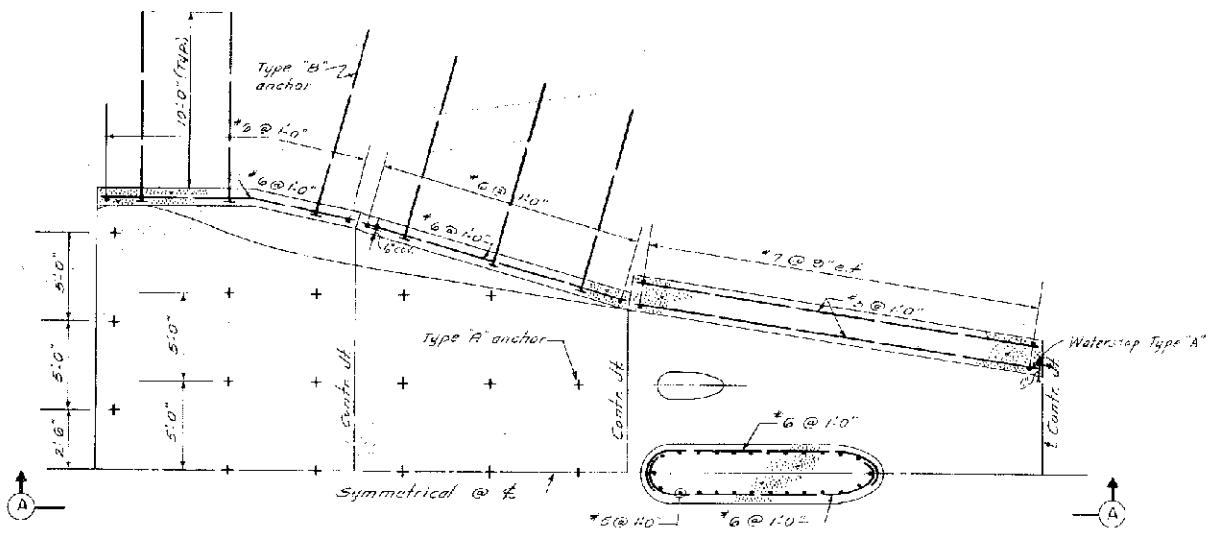
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

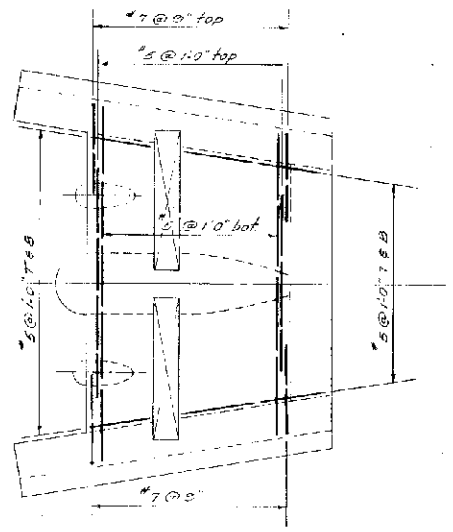
SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-015-62-49
DRAWING NUMBER
CT-I-5747
SHEET 41

CORPS OF ENGINEERS

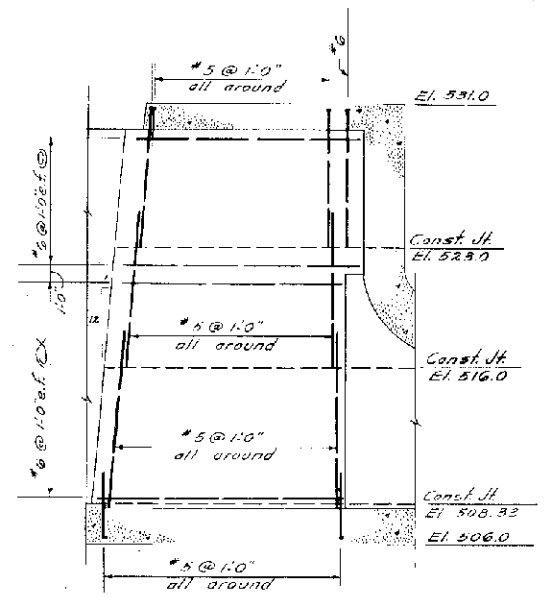
U. S. ARMY



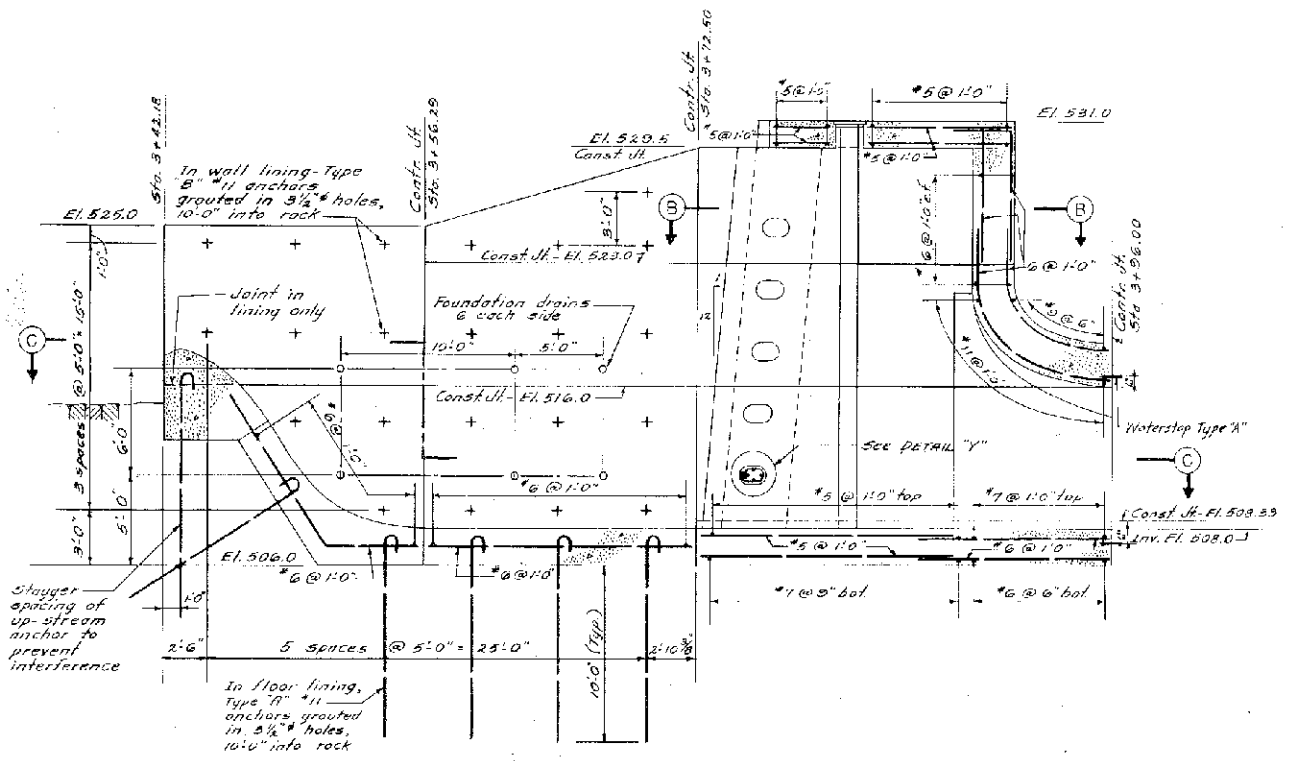
HALF SECTION C-C
SCALE 1/4"=1'-0"



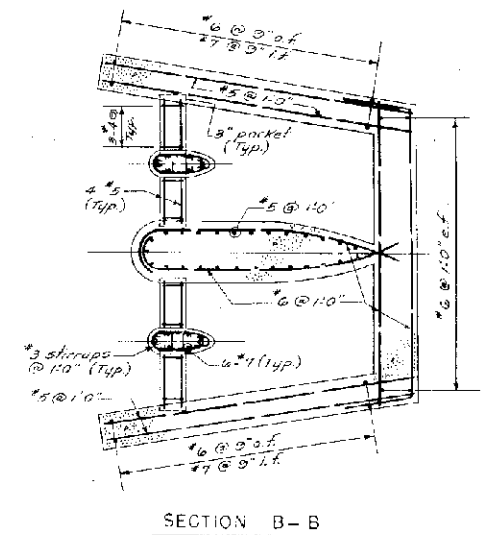
PLAN OF
TRASH PLATFORM
SCALE 1/4"=1'-0"



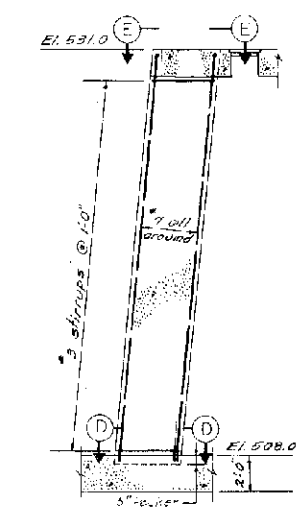
ELEVATION OF CENTER PIER
SCALE 1/4"=1'-0"



SECTION A-A
SCALE 1/4"=1'-0"



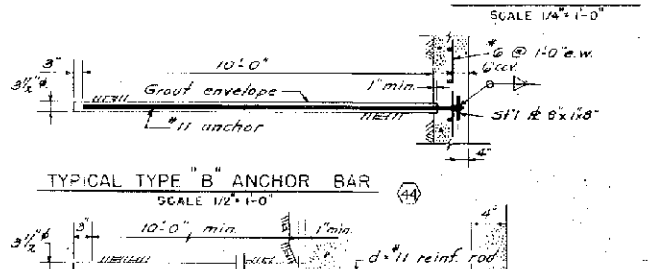
SECTION B-B
SCALE 1/4"=1'-0"



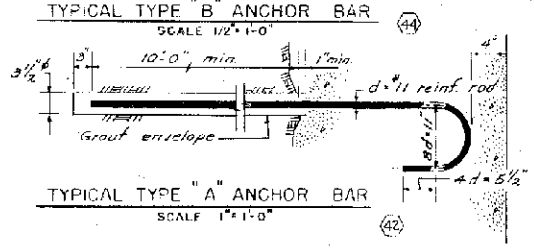
TRASH BAR
SCALE 1/4"=1'-0"

NOTES

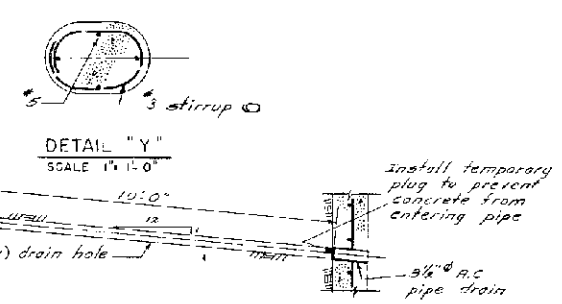
For general notes applying to this sheet except concrete pigment item, refer to Sheet No. 49.
For concrete details pertaining to this sheet see sheet Nos. 45 and 41.
Pigment for concrete shown on this sheet will be made in item No. 49.
For construction joint detail, see Sheet 30.



TYPICAL TYPE "B" ANCHOR BAR
SCALE 1½"=1'-0"

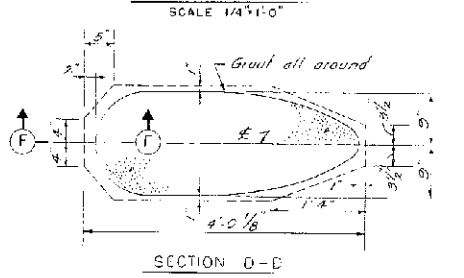


TYPICAL TYPE "A" ANCHOR BAR
SCALE 1"=1'-0"

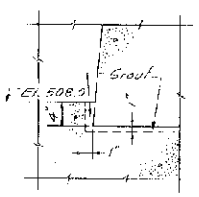


DETAIL "Y"
SCALE 1"=1'-0"

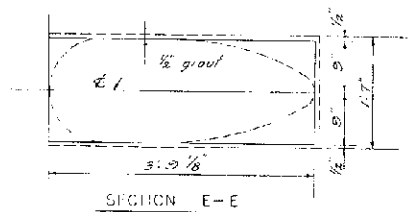
TYPICAL FOUNDATION DRAIN DETAIL
SCALE 1½"=1'-0"



SECTION D-D



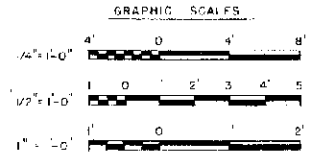
SECTION F-F



SECTION E-E

TRASH RACK BAR DETAILS
SCALE 1"=1'-0"

GRAPHIC SCALES



REVISION	DATE	DESCRIPTION

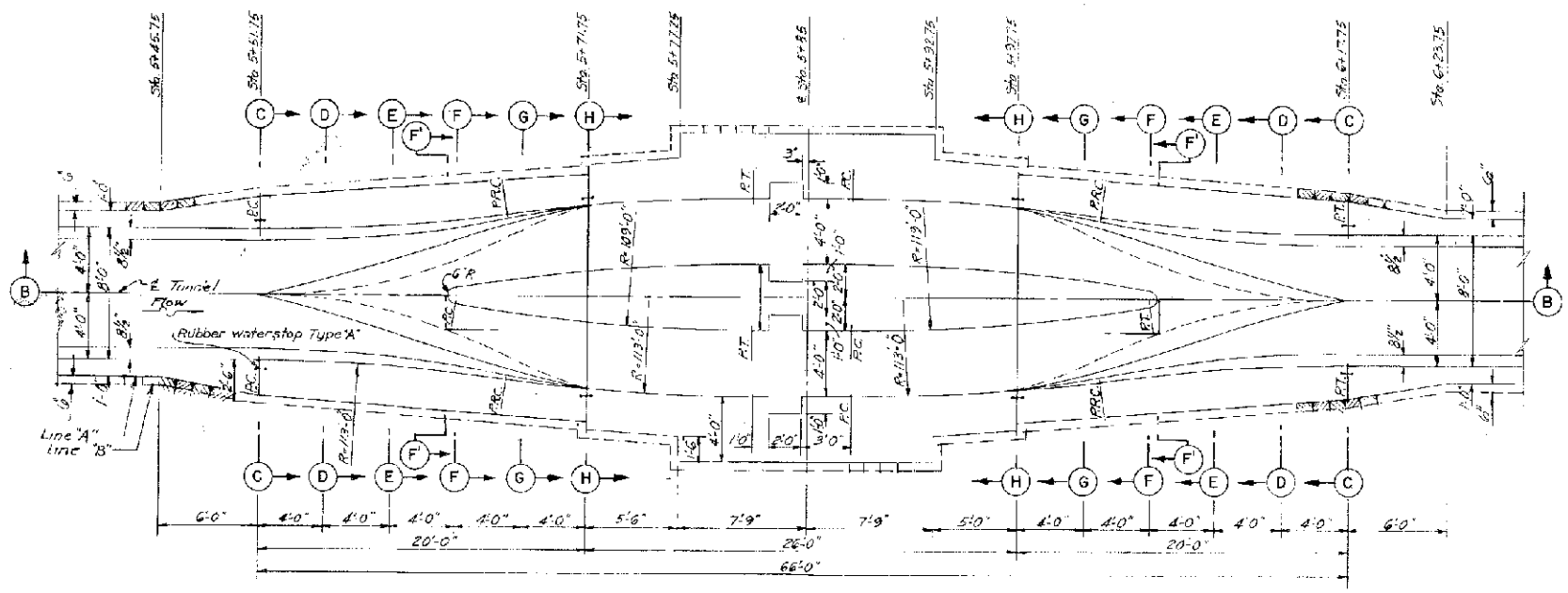
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.M.L.	DR. BY C.M.A.	CK. BY
SUBMITTED: CHIEF, STRUCT. SECTION		
PROJECT ENGINEER		
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH		
APPROVAL RECOMMENDED: CHIEF, E. & D. BRANCH		

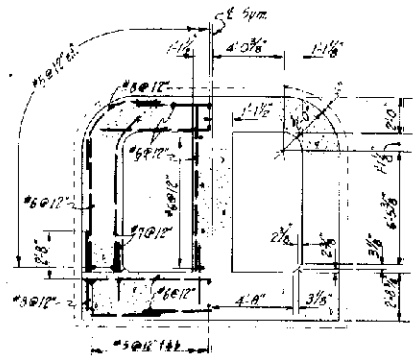
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL INTAKE STRUCTURE
REINFORCING DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVED: CHIEF, ENGINEERING DIVISION
DATE: MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5748
SHEET 42

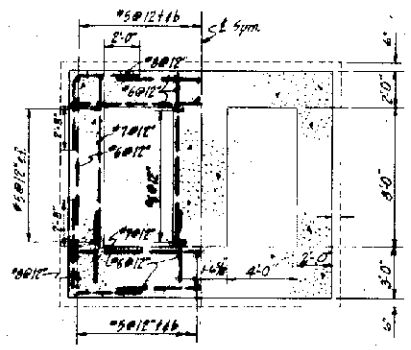
CORPS OF ENGINEERS — U.S. ARMY



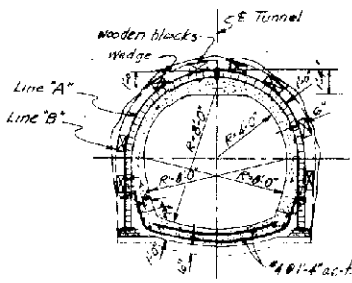
SECTION A-A
SCALE: 1/4"=1'-0"



SECTION G-G
SCALE: 1/4"=1'-0"

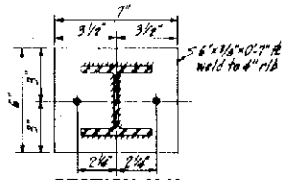


SECTION H-H
SCALE: 1/4"=1'-0"

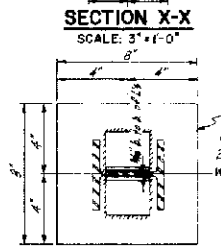


Provide blocking tightly between rib and rock. Blocking to be spaced not more than 2'-6" c.c. on periphery of ribs

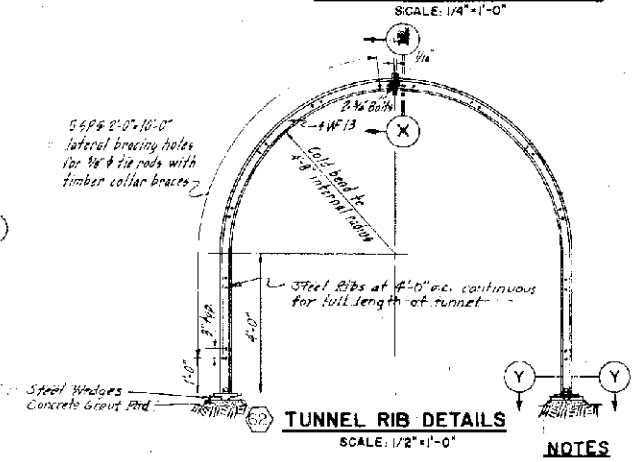
TYPICAL TUNNEL SECTION
SCALE: 1/4"=1'-0"



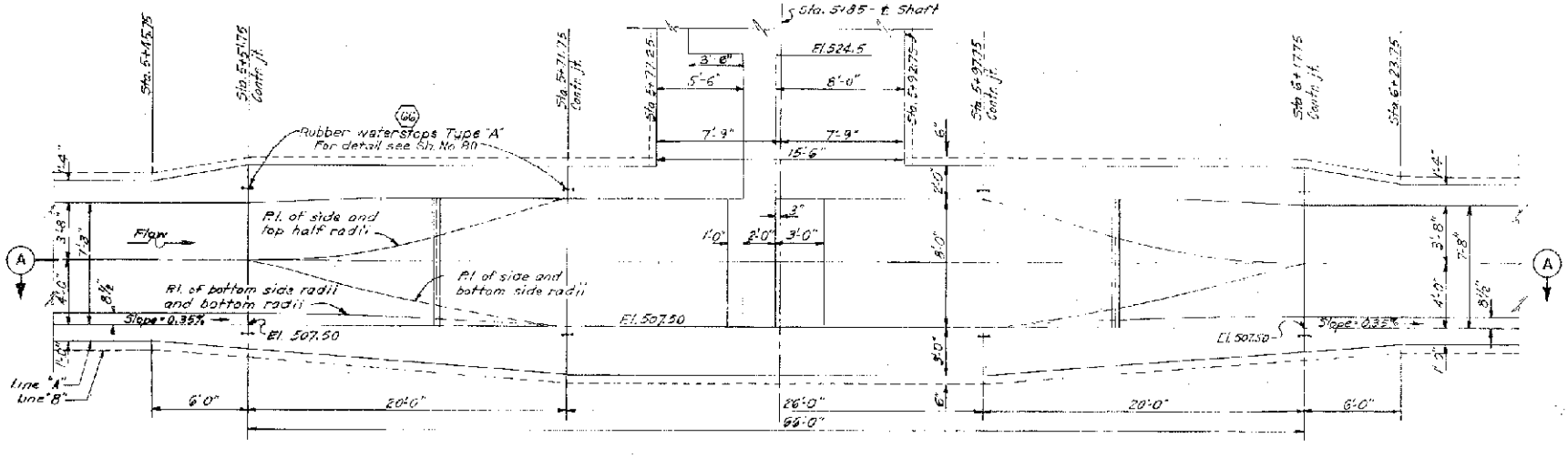
SECTION X-X
SCALE: 3"=1'-0"



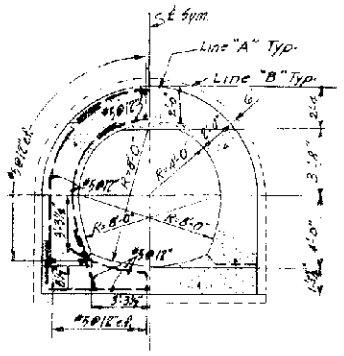
SECTION Y-Y
SCALE: 3"=1'-0"



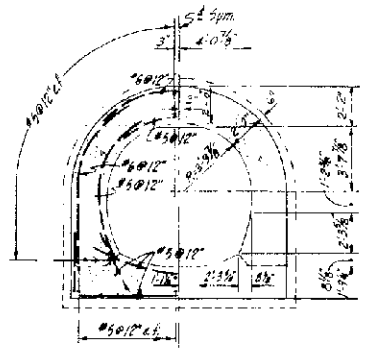
TUNNEL RIB DETAILS
SCALE: 1/2"=1'-0"



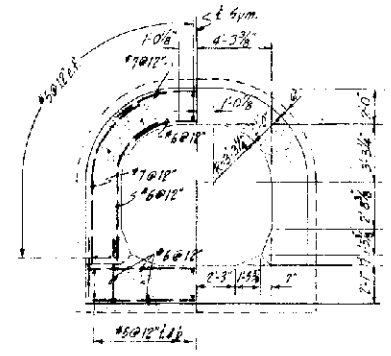
SECTION B-B
SCALE: 1/4"=1'-0"



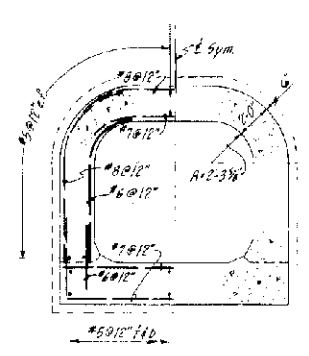
SECTION C-C
SCALE: 1/4"=1'-0"



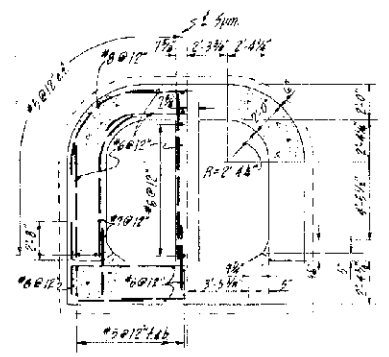
SECTION D-D
SCALE: 1/4"=1'-0"



SECTION E-E
SCALE: 1/4"=1'-0"



SECTION F¹-F¹
SCALE: 1/4"=1'-0"



SECTION F-F
SCALE: 1/4"=1'-0"

GRAPHIC SCALES
1/4"=1'-0"
1/2"=1'-0"

NOTES

For general notes applying to this sheet, see sheet No. 49
For contraction joint details, see sheet No 80.
All concrete from Sta. 5+42.75 to 6+23.75 will be paid for under Item No. 51

GRAPHIC SCALES
3"=1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

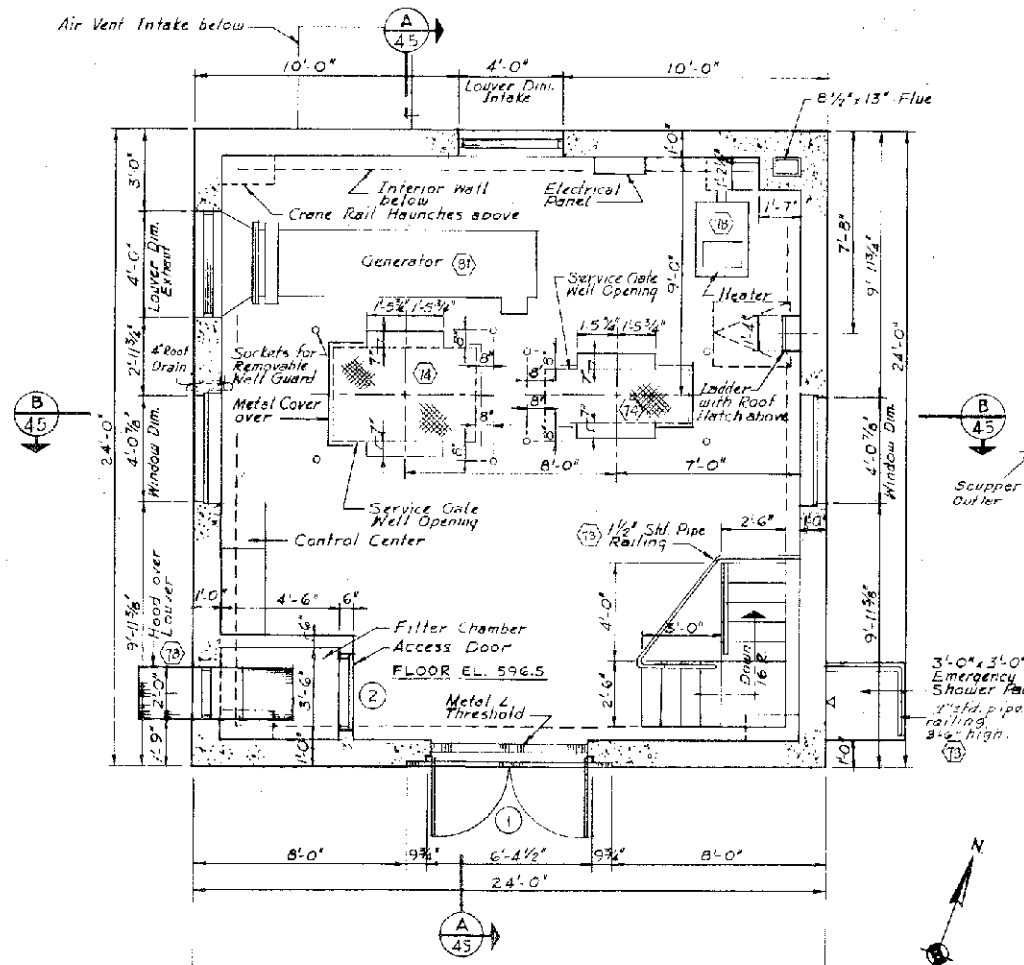
DES. BY	DR. BY	CK. BY
P.H.	K.H.W.	J.H.

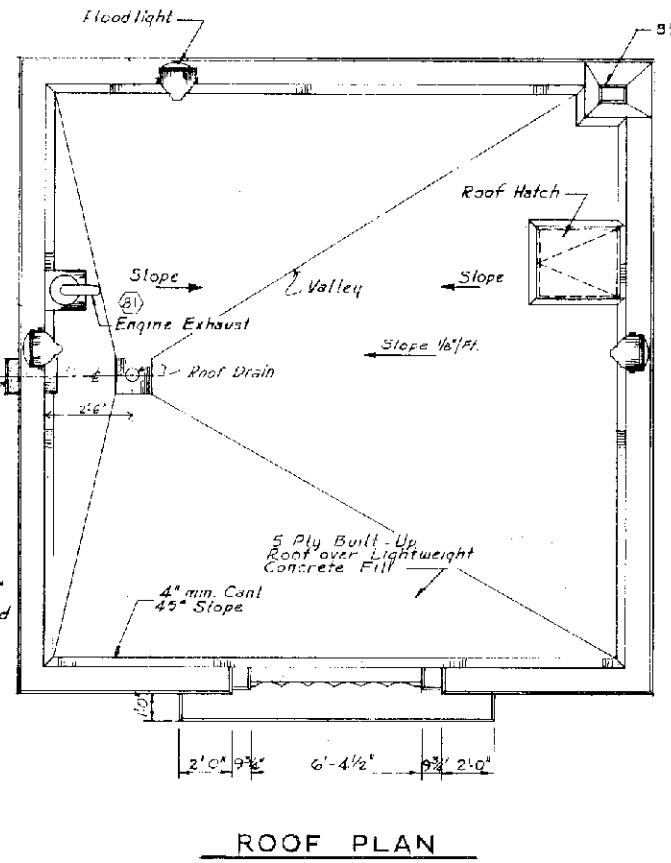
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, ENGINEERING BRANCH
APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION

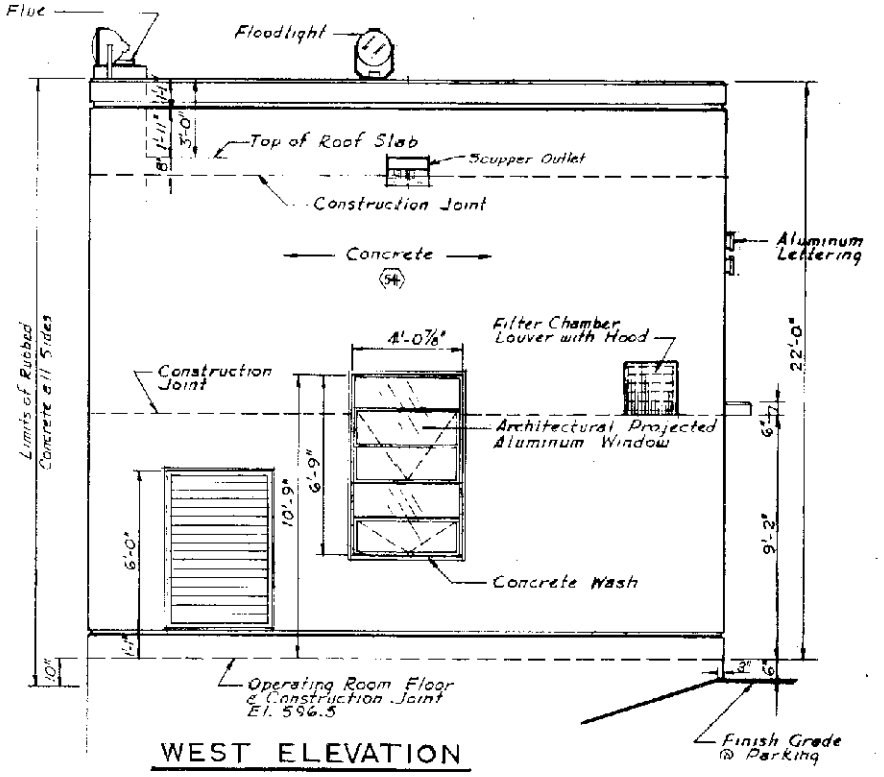
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL TUNNEL AND TRANSITION SECTIONS AND REINFORCING DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVED
DATE: MARCH 1962
CHIEF, ENGINEERING DIVISION

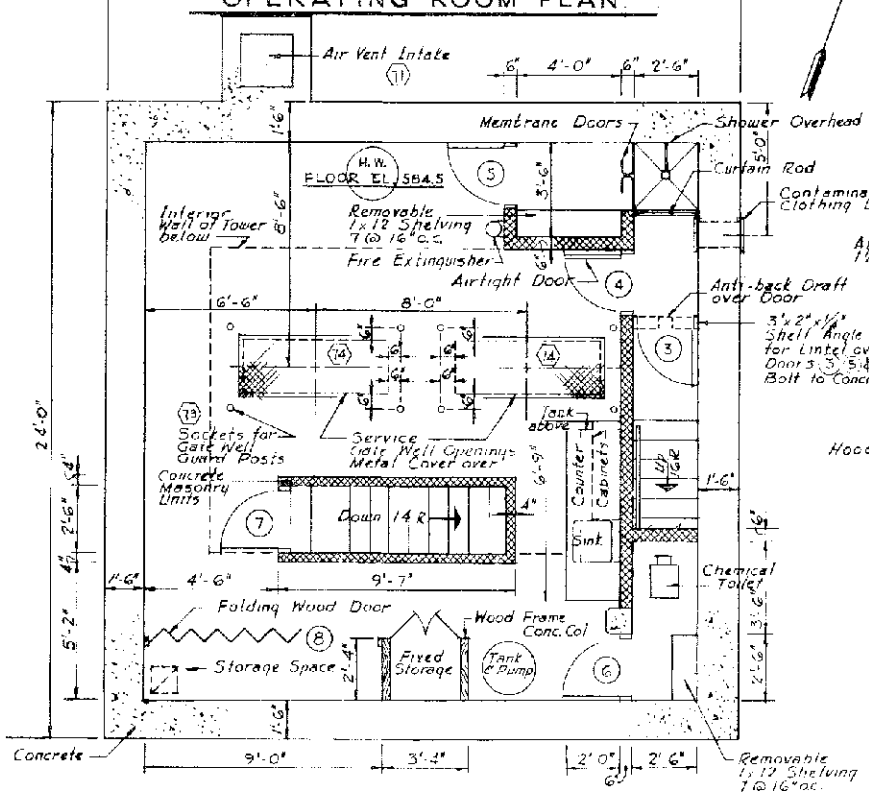
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5749
SHEET 43

CORPS OF ENGINEERS — U. S. ARMY

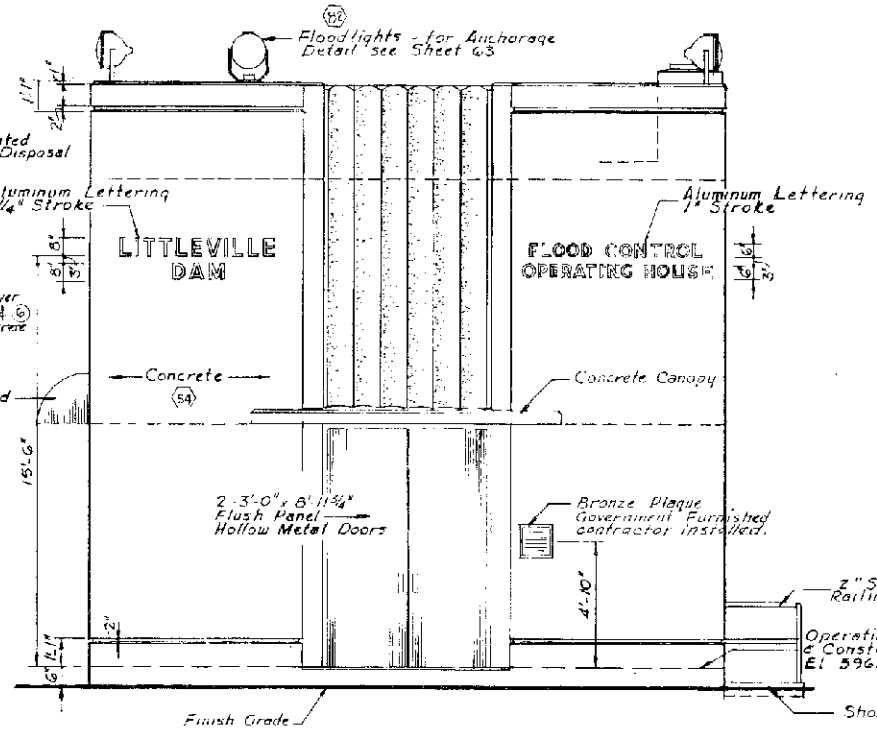


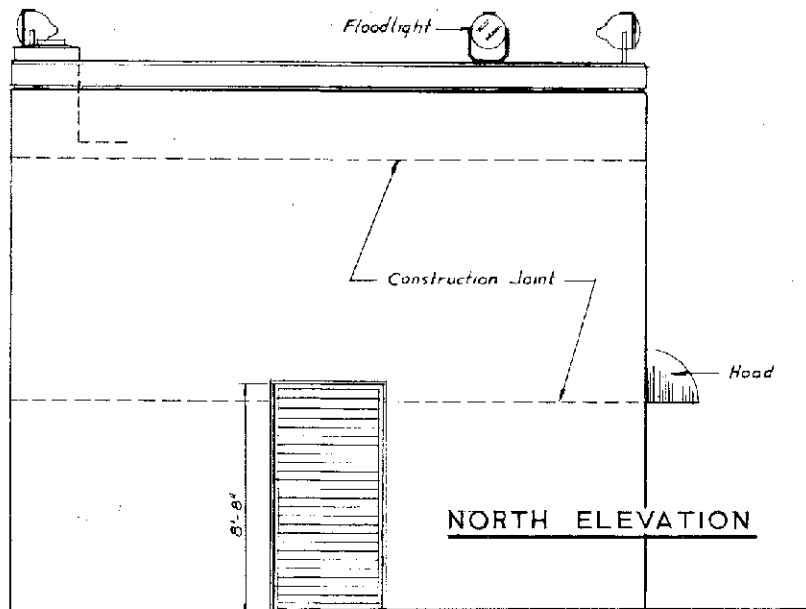






Note: Carry Concrete Masonry Unit Walls to Underside of Concrete Slab.
2. All items in this sheet will be paint under Item 52 unless otherwise noted.





GRAPHIC SCALE
4' 0 4'
3/8" = 1'-0"

REVISION	DATE	DESCRIPTION

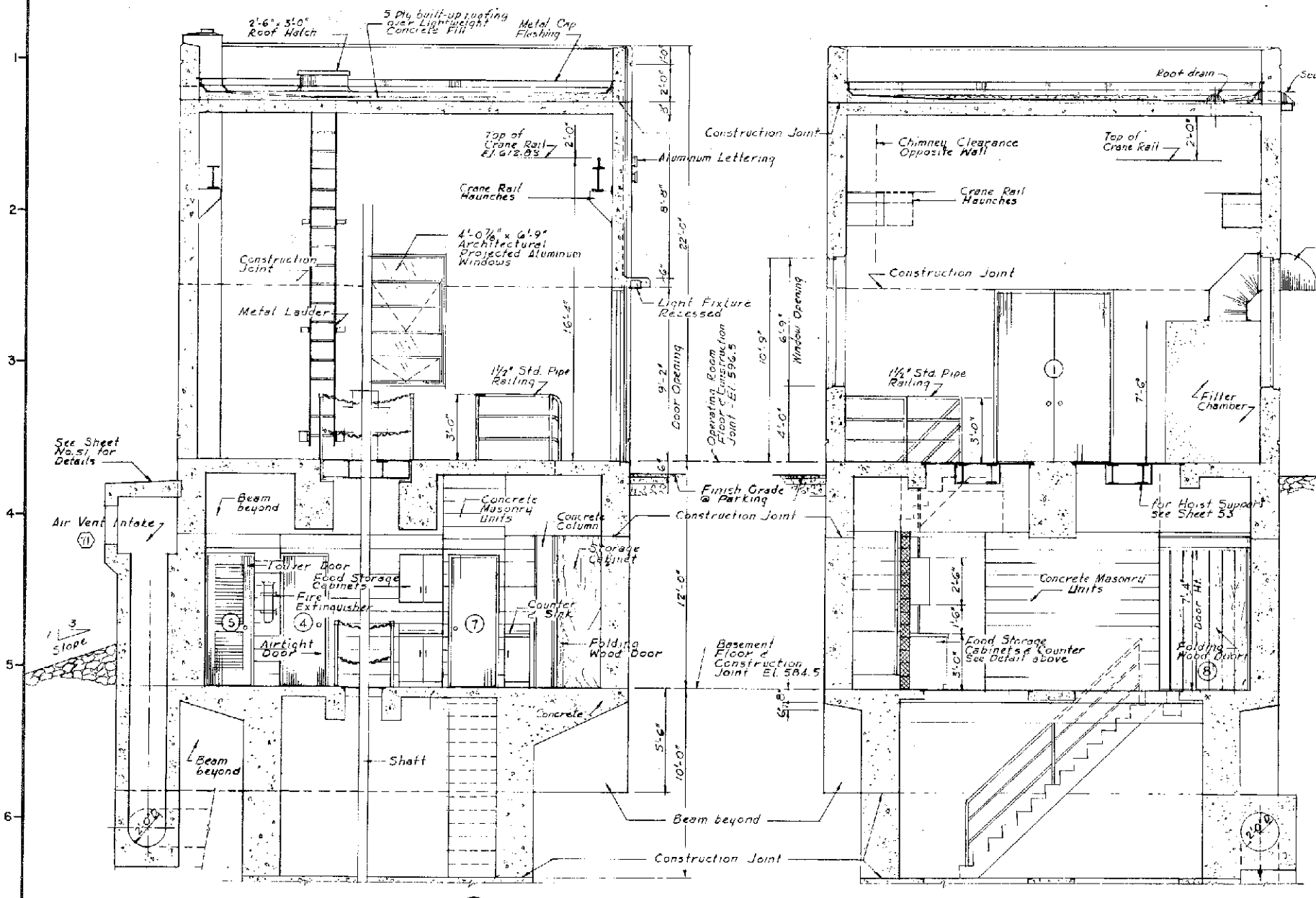
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.C.G. DR. BY W.C. CK. BY
SUBMITTED
CHIEF, ARCH. SECTION
PROJ. ENGINEER
RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ARCHITECTURAL
PLANS AND ELEVATIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.
APPROVED
DATE MARCH 1962

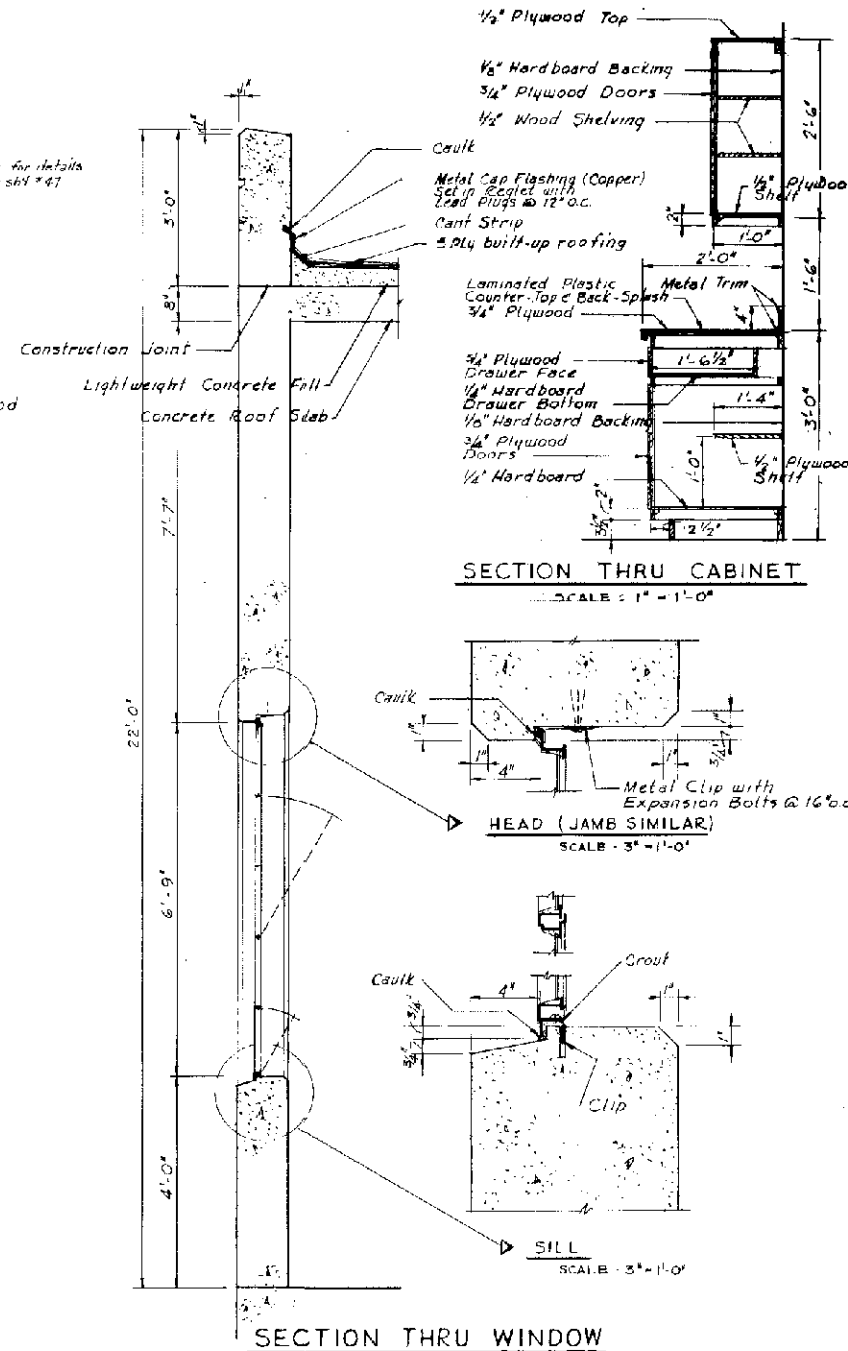
SCALE: 3/8"=1'-0" SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-I-5750
SHEET 44

CORPS OF ENGINEERS — U. S. ARMY



SECTION (A/44)
SCALE - 3/8" = 1'-0"

SECTION (B/44)
SCALE - 3/8" = 1'-0"

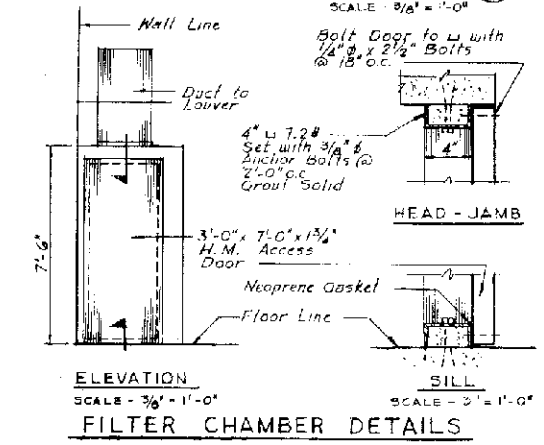


HEAD (JAMB SIMILAR)
SCALE - 3" = 1'-0"

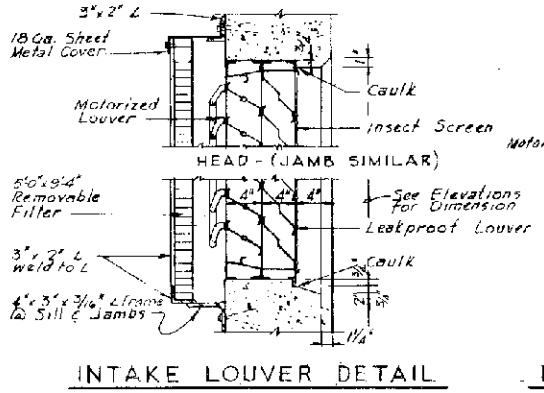
SILL
SCALE - 3" = 1'-0"

SECTION THRU WINDOW
SCALE - 3/4" = 1'-0"

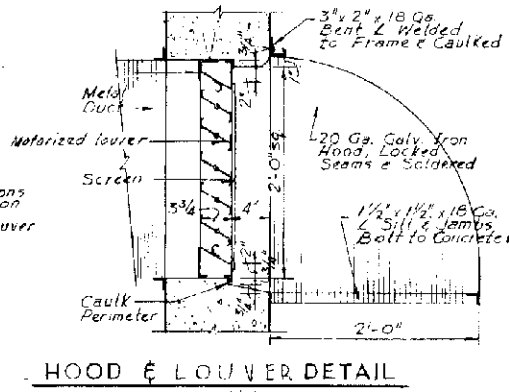
SECTION THRU CABINET
SCALE - 1" = 1'-0"



FILTER CHAMBER DETAILS



INTAKE LOUVER DETAIL
SCALE - 1½" = 1'-0"



HOOD & LOUVER DETAIL
SCALE - 1½" = 1'-0"

GRAPHIC SCALE

3/16" = 1'-0"
3/4" = 1'-0"
1½" = 1'-0"
3" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. | DR. BY W.C. | CK. BY

SUBMITTED: Chief, Arch. Section
PROJECT ENGINEER
APPROVAL RECOMMENDED: Chief, Des. Br. Branch
APPROVAL RECOMMENDED: Chief, P. & R. Branch
APPROVED: Chief, Engineering Division
DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ARCHITECTURAL
SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

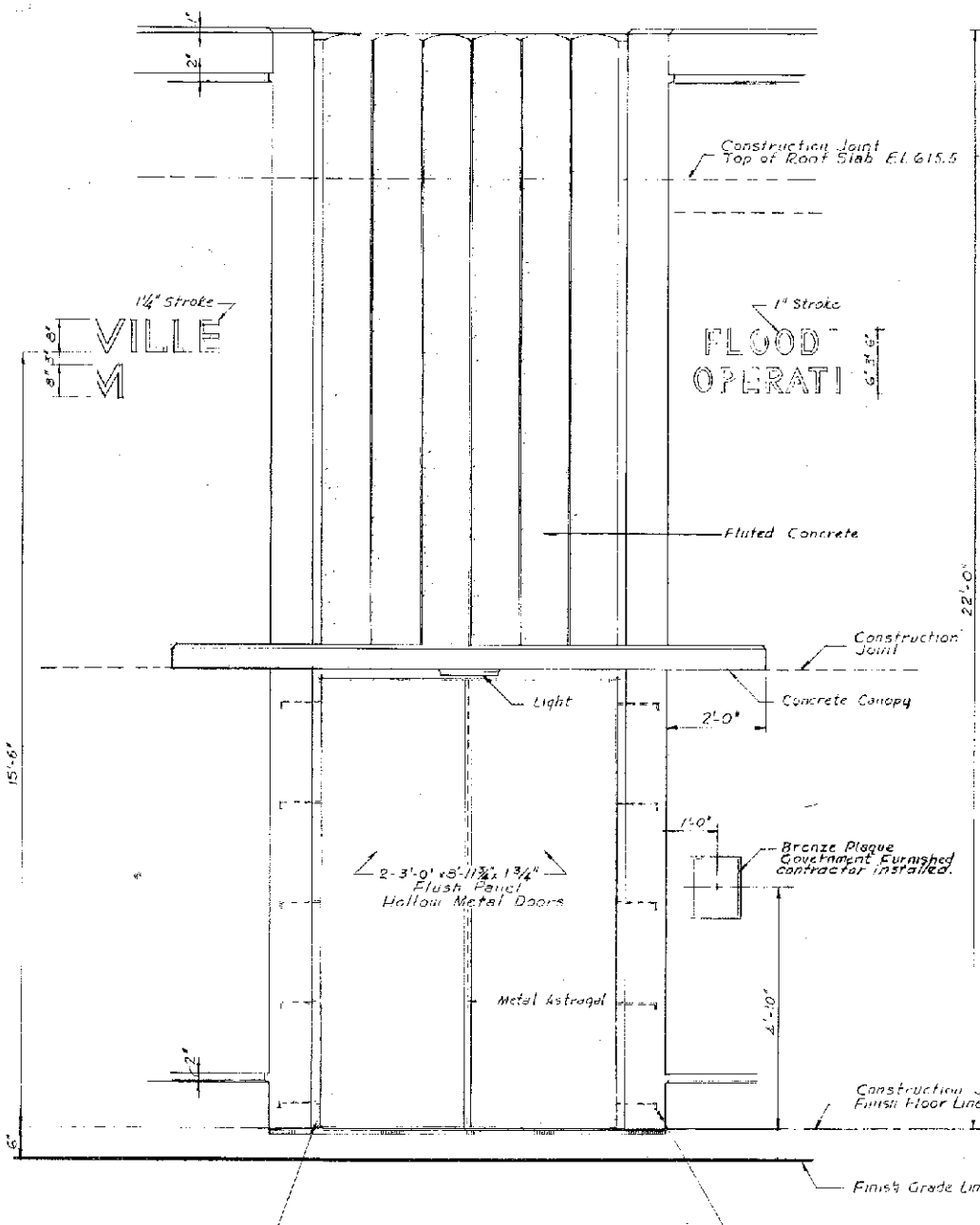
SCALE: 3/8" = 1'-0" | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5751
SHEET 45

CORPS OF ENGINEERS — U. S. ARMY

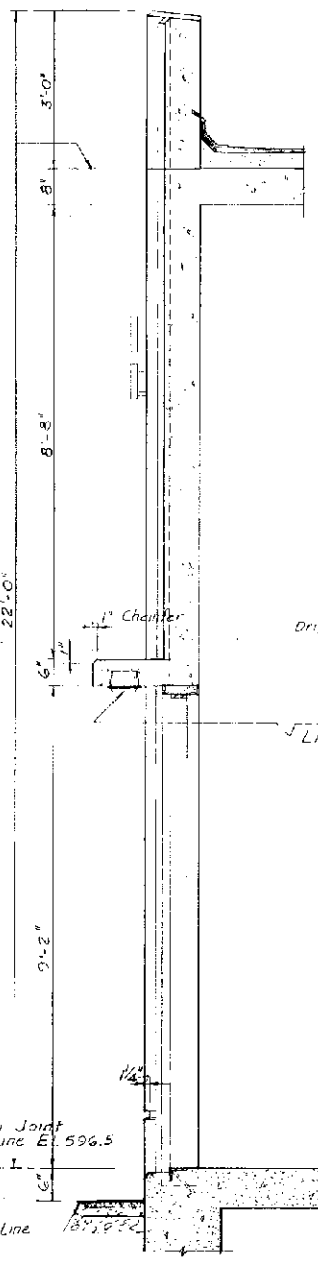
DOOR SCHEDULE

NO.	SIZE	DESCRIPTION	REMARKS
(1)	3'-0" x 8'-11¾"	Flush Panel Hollow Metal	Channel Frame (Similar for N. S. TOWER)
(2)	3'-0" x 7'-0"	Do	Airtight door see detail
(3)	2'-2" x 6'-10"	Do	Airtight door see detail
(4)	Do	Do	Do
(5)	Do	Do	Louvered Door
(6)	Do	Do	
(7)	Do	Do	Similar for Water supply tower
(8)	9'-0" x 7'-6"	Folding Wood	

Note: Doors 1 thru 7 shall be 1¾" thick

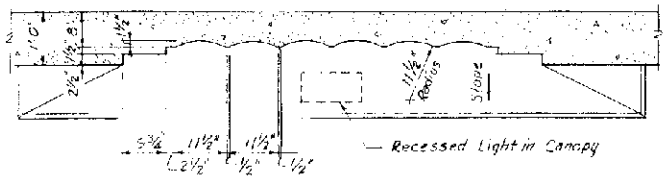


ENTRANCE ELEVATION
SCALE - 3/4" = 1'-0"

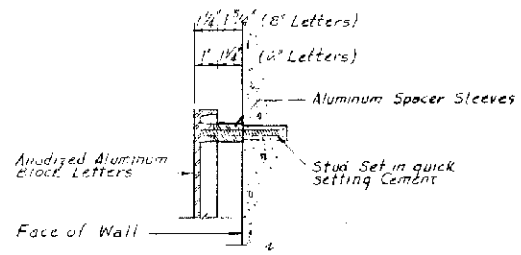


SECTION THRU ENTRANCE
SCALE - 3/4" = 1'-0"

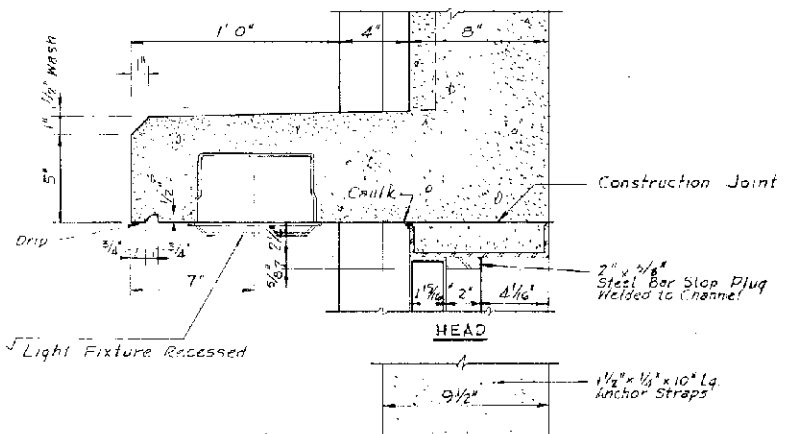
PLAN
SCALE - 3/4" = 1'-0"

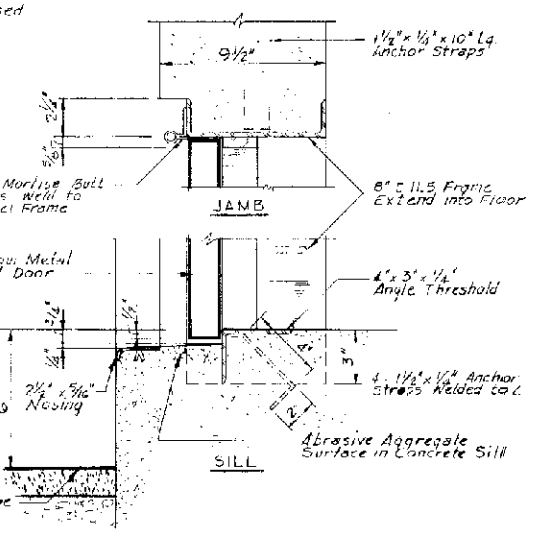


PLAN ABOVE ENTRANCE
SCALE - 3/4" = 1'-0"

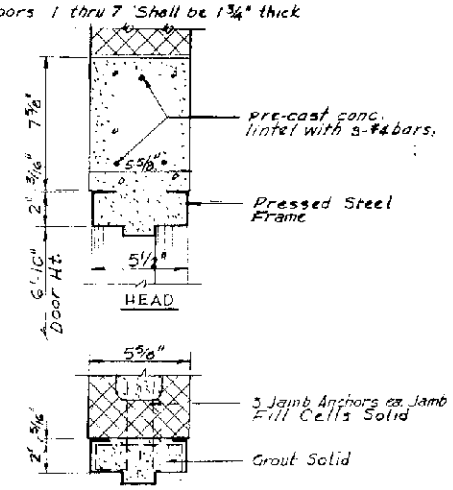


LETTERING DETAIL
SCALE: 3" = 1'-0"

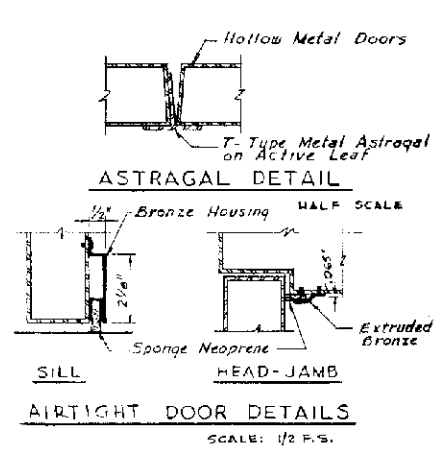




ENTRANCE DOOR DETAILS
SCALE - 3" = 1'-0"



INTERIOR DOOR DETAILS
SCALE - 3" = 1'-0"



AIRTIGHT DOOR DETAILS
SCALE: 1/2 F.S.

GRAPHIC SCALES

3/4" = 1'-0"
1" 0 1" 2" 3"

3" = 1'-0"
5" 0 3" 6" 12"

6" = 1'-0"
1" 3 1" 2" 3" 4" 5"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

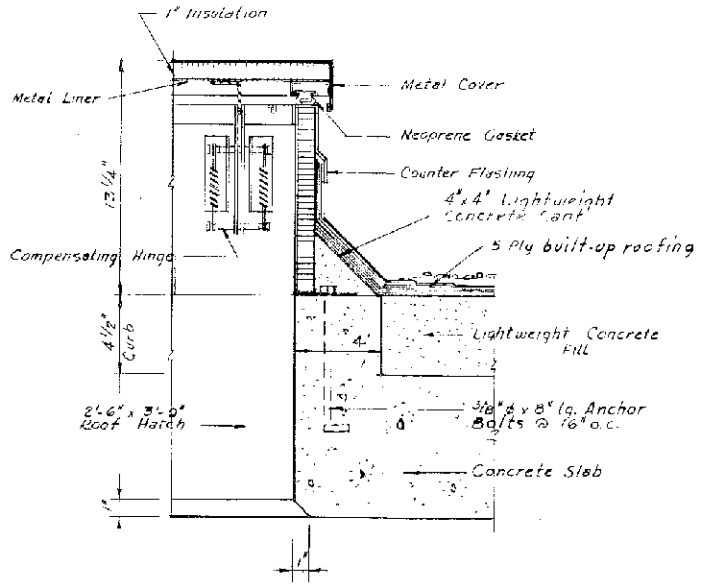
DES. BY J.C.G. | DR. BY W.C. | CK. BY

SUBMITTED: CHIEF, ARCH. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: CHIEF, P & C BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION
DATE: MARCH 1955

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ARCHITECTURAL
ENTRANCE DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

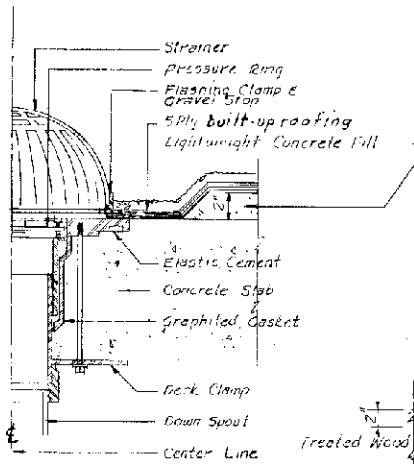
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-52-49
DRAWING NUMBER
CT-I-5752
SHEET 46

CORPS OF ENGINEERS — U. S. ARMY



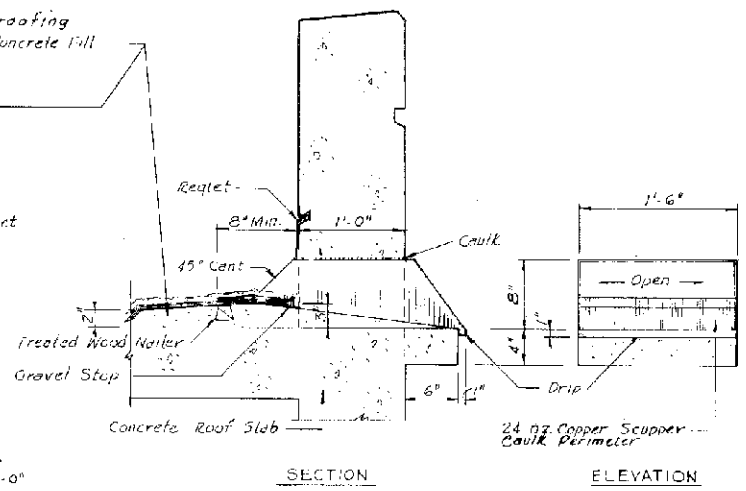
ROOF HATCH DETAIL

SCALE - 3" = 1'-0"



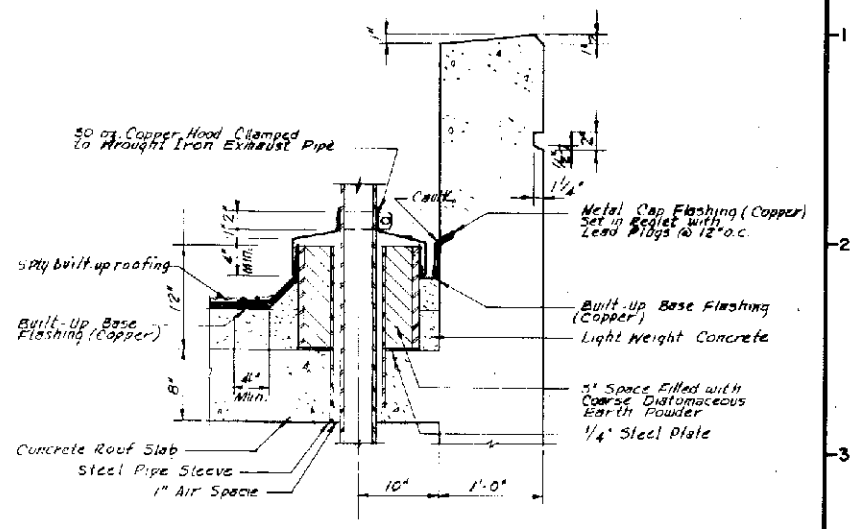
ROOF DRAIN DETAIL

SCALE - 3" = 1'-0"



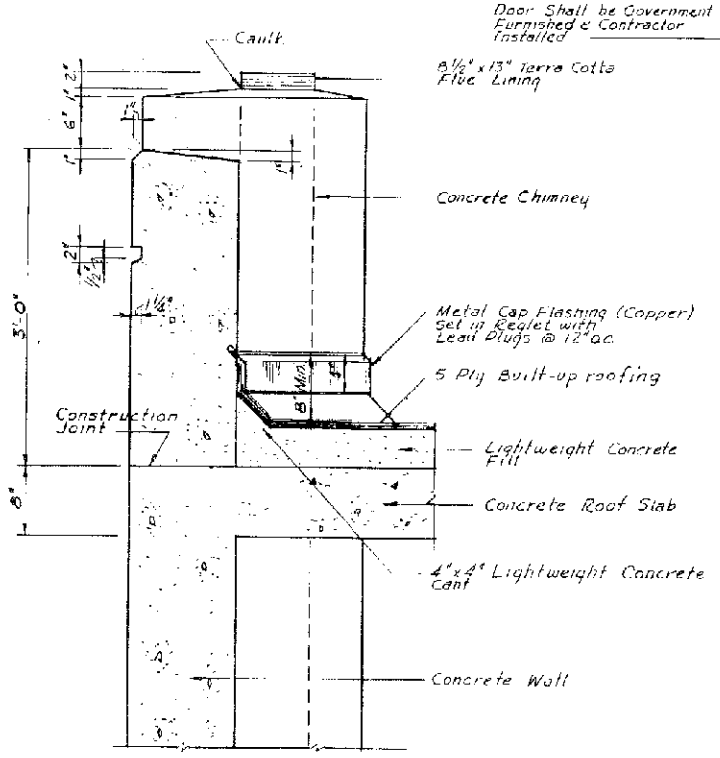
SCUPPER DETAILS

SCALE - 1½" = 1'-0"



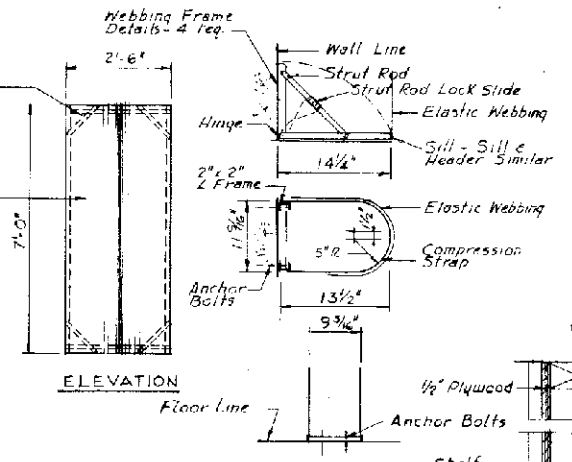
ENGINE EXHAUST DETAIL AT ROOF

SCALE - 1½" = 1'-0"



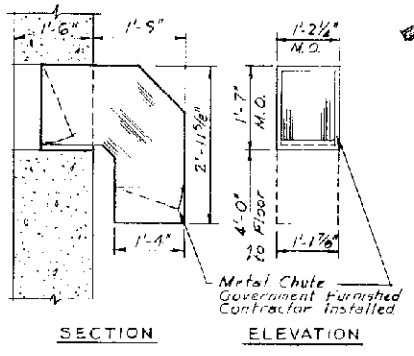
CHIMNEY DETAIL

SCALE - 1½" = 1'-0"



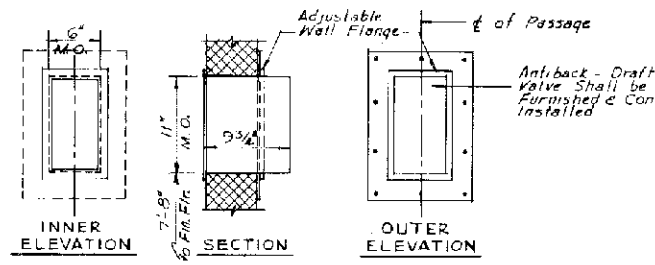
MEMBRANE DOOR DETAILS

NO SCALE



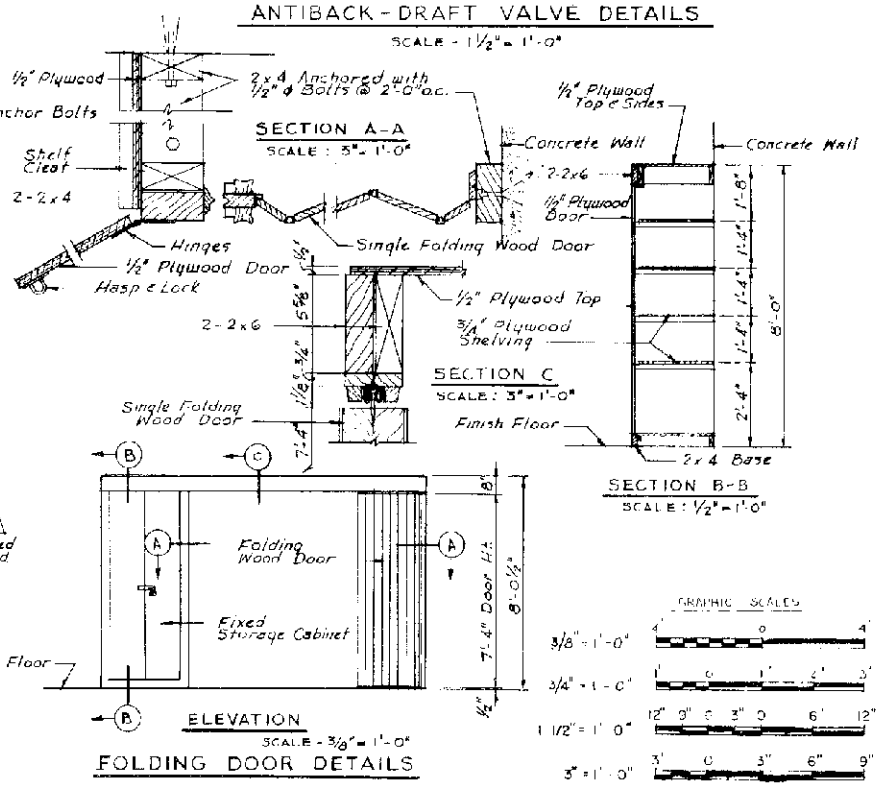
CONTAMINATED CLOTHES CHUTE

SCALE - 3/4" = 1'-0"

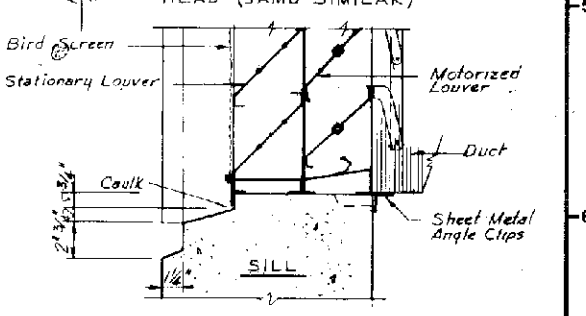


ANTIBACK - DRAFT VALVE DETAILS

SCALE - 1½" = 1'-0"



FOLDING DOOR DETAILS



MOTORIZED EXHAUST LOUVER DETAIL

SCALE - 3" = 1'-0"

GRAPHIC SCALES

3/8" = 1'-0"

3/4" = 1'-0"

1 1/2" = 1'-0"

3" = 1'-0"

DIVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY W.C. | DR. BY W.C. | CK. BY J.V.

SUBMITTED: Salvucci, CHIEF, AREA SECTION

APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: MARCH 1952

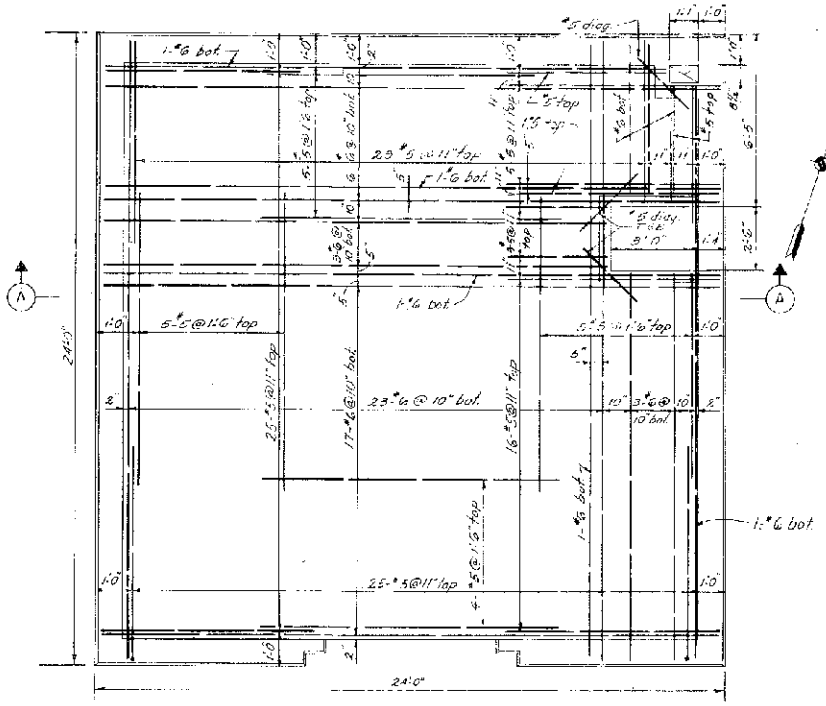
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT AND WATER SUPPLY TOWER
ARCHITECTURAL-MISCELLANEOUS DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-52-49

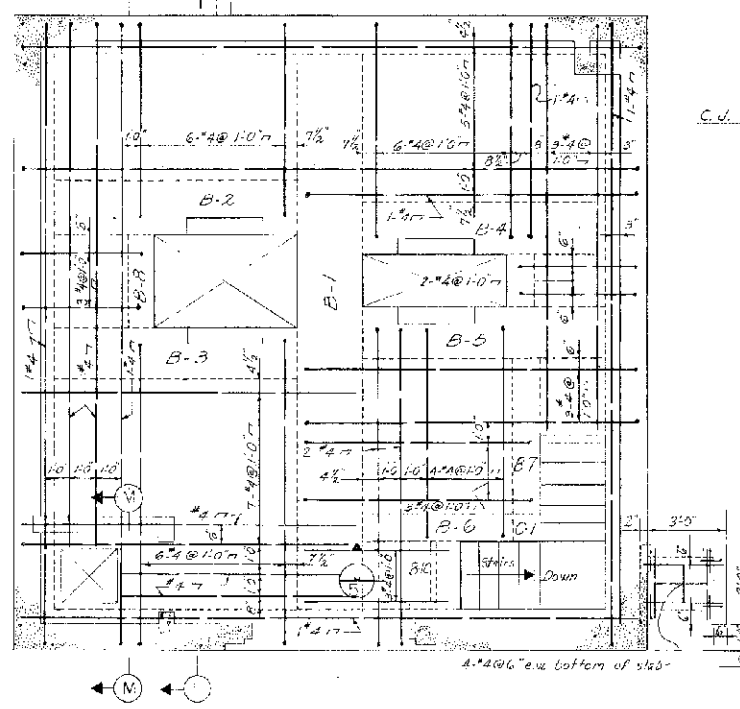
DRAWING NUMBER
CT-I-5753

SHEET 47

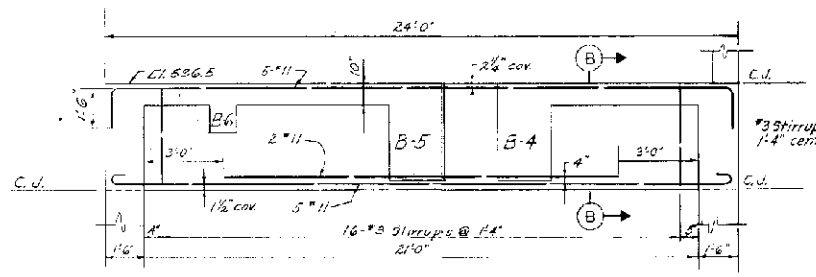
CORPS OF ENGINEERS — U. S. ARMY



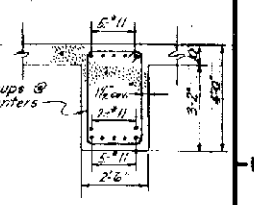
PLAN - OPERATING ROOM ROOF
SCALE 3/8" = 1'-0"



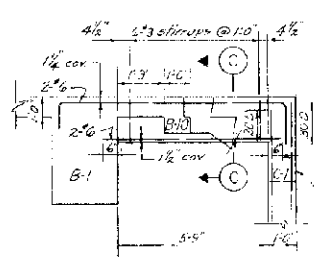
PLAN - OPERATING ROOM FLOOR
(TOP STEEL)
SCALE 3/8" = 1'-0"



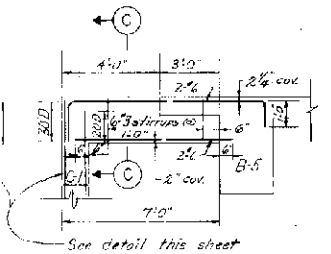
BEAM B-1
SCALE 3/8" = 1'-0"



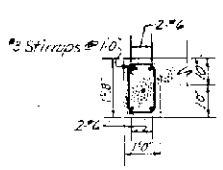
SECTION B-B
SCALE 3/8" = 1'-0"



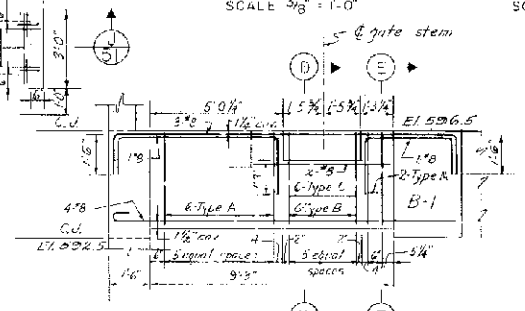
BEAM B-6
SCALE 3/8" = 1'-0"



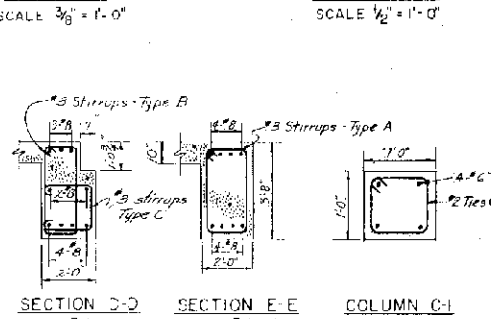
BEAM B-7
SCALE 3/8" = 1'-0"



SECTION C-C
SCALE 1/2" = 1'-0"



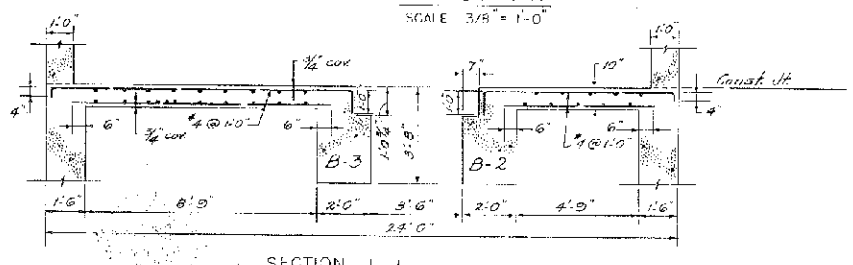
BEAMS B2 & B3
BEAMS B4 & B5 SIMILAR EXCEPT OPPOSITE HAND
SCALE 3/8" = 1'-0"



SECTION D-D
SCALE 3/8" = 1'-0"

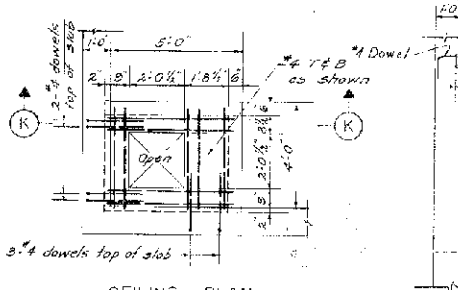
SECTION E-E
SCALE 3/8" = 1'-0"

COLUMN C-1
SCALE 1" = 1'-0"

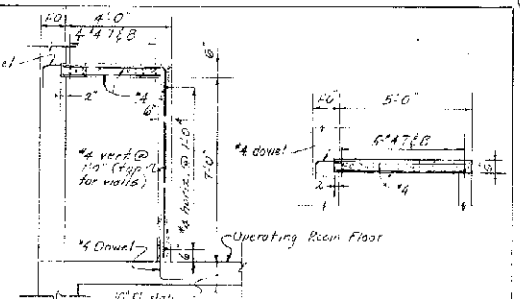


SECTION A-A
SCALE 3/8" = 1'-0"

SECTION L-L
SCALE 3/8" = 1'-0"



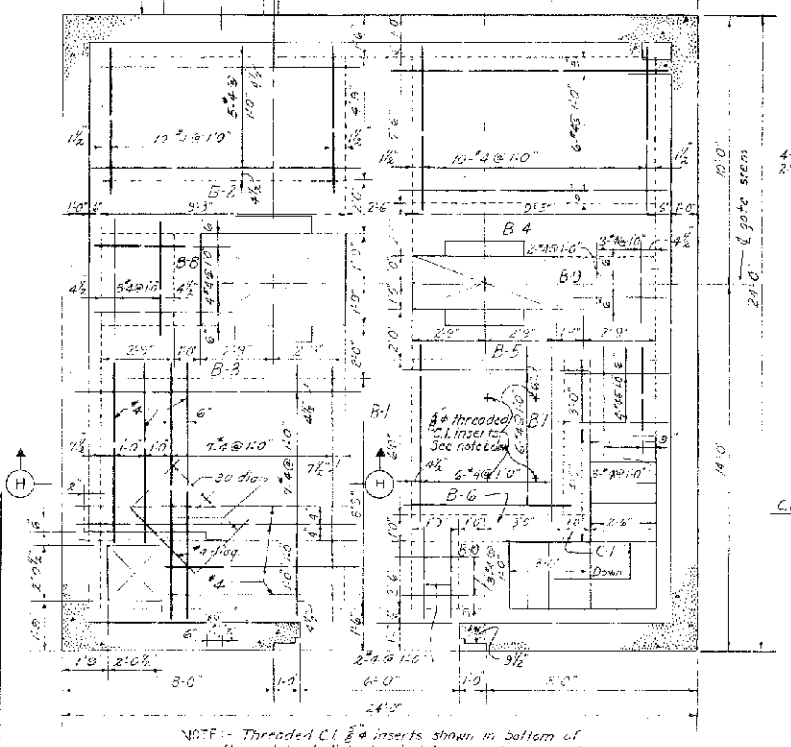
CEILING PLAN
SCALE 3/8" = 1'-0"



SECTION M-M
SCALE 3/8" = 1'-0"

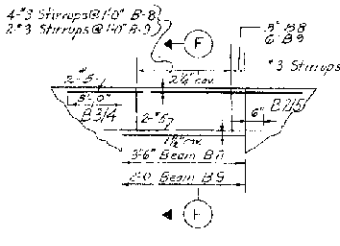
SECTION K-K
SCALE 3/8" = 1'-0"

FILTER CHAMBER

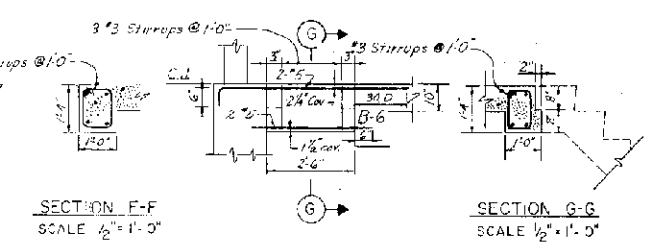


NOTE:- Threaded C.I. ℄ inserts shown in bottom of floor slab shall be located to properly support glass lined 80 gal. water tank furnished.

PLAN - OPERATING ROOM FLOOR
ELEV. 596.5
BOTTOM STEEL
SCALE 3/8" = 1'-0"



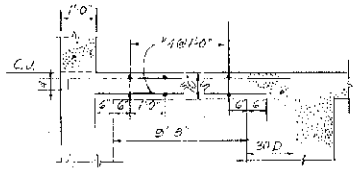
BEAMS B-14 & B-15
SCALE 1/2" = 1'-0"



SECTION F-F
SCALE 1/2" = 1'-0"

BEAM B-10
SCALE 1/2" = 1'-0"

SECTION G-G
SCALE 1/2" = 1'-0"



SECTION H-H
SCALE 1/2" = 1'-0"

NOTE
For general notes see Sheet No. 49

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
C.C.C.	E.W.S.	J.F.W.

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER

RECOMMENDED
CHIEF, DESIGN BRANCH

RECOMMENDED
CHIEF, E & D BRANCH

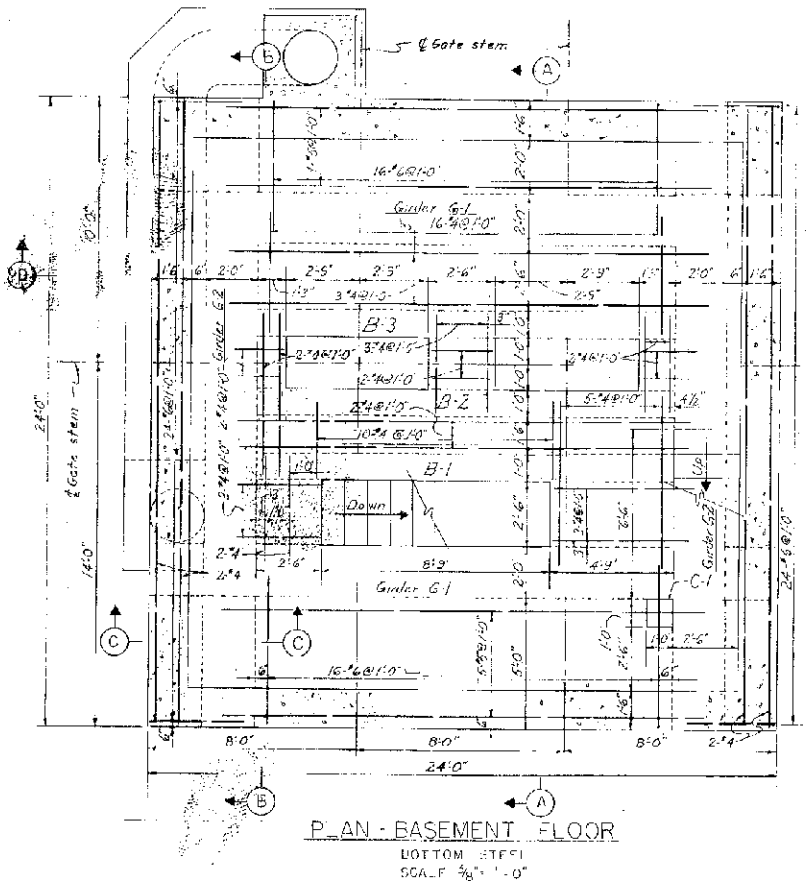
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
ROOF & OPER. FLOOR SLABS-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF ENGINEERING DIVISION
DATE MARCH 1962

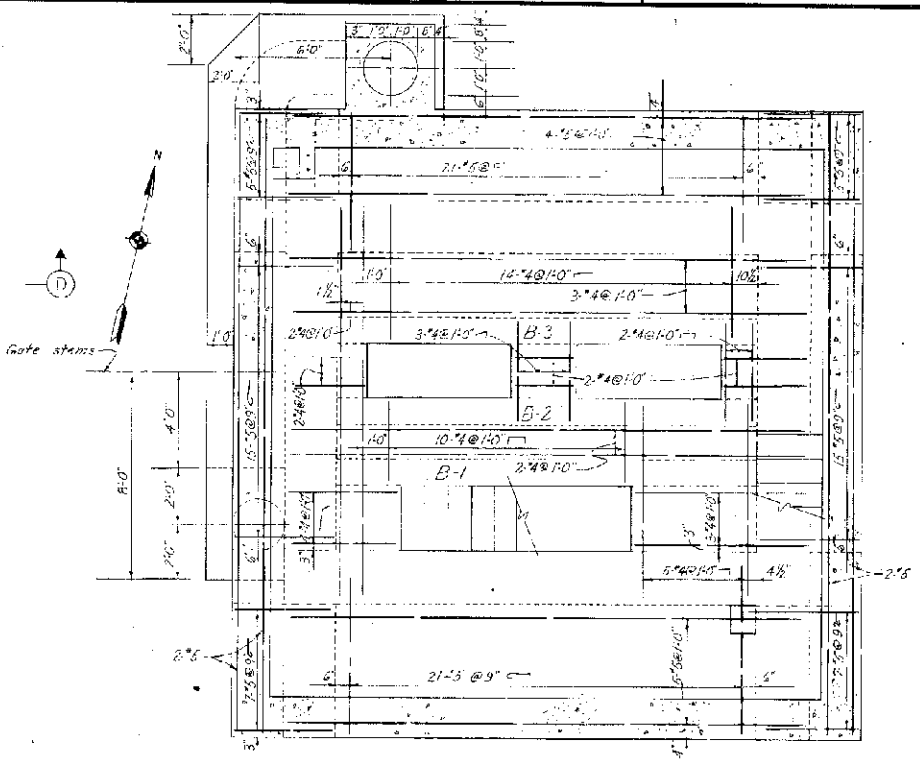
GRAPH 2 SCALES
3/8" = 1'-0"
1/2" = 1'-0"
1" = 1'-0"

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5754
SHEET 48

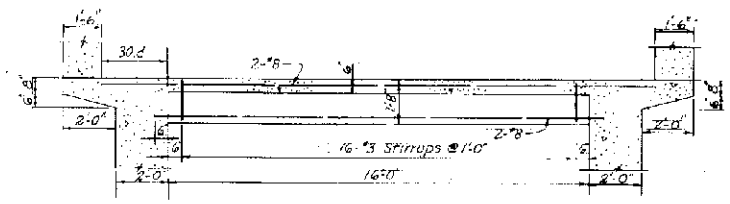
CORPS OF ENGINEERS — U. S. ARMY



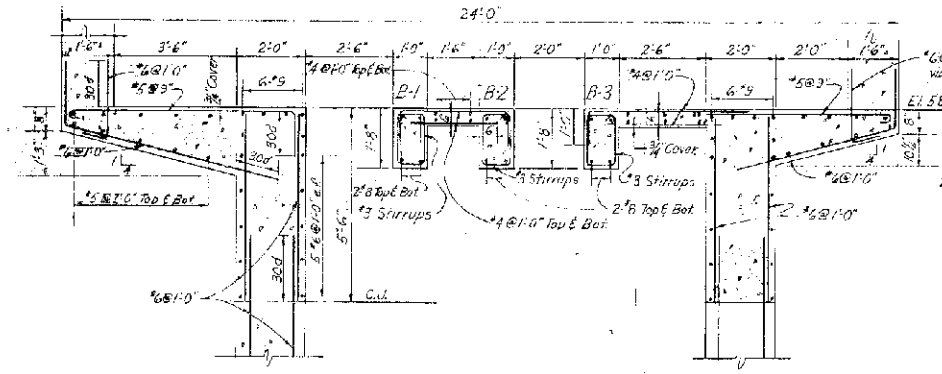
PLAN - BASEMENT FLOOR
BOTTOM STEEL
SCALE 3/8" = 1'-0"



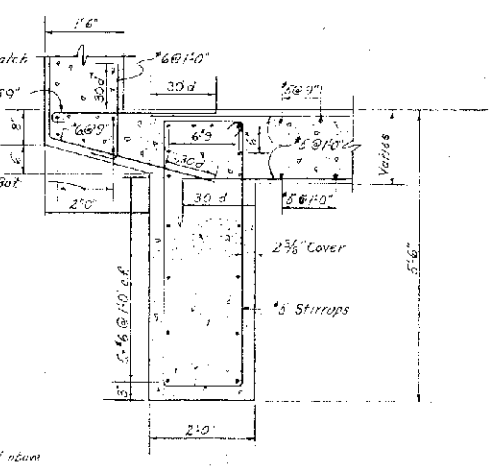
PLAN - BASEMENT FLOOR
TOP STEEL
SCALE 3/8" = 1'-0"



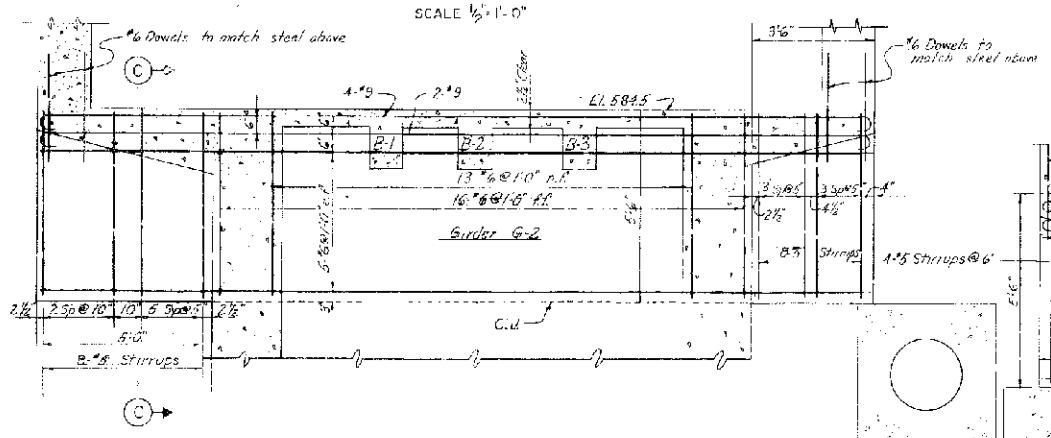
BEAMS B-1, B-2 & B-3
SCALE 3/8"=1'-0"



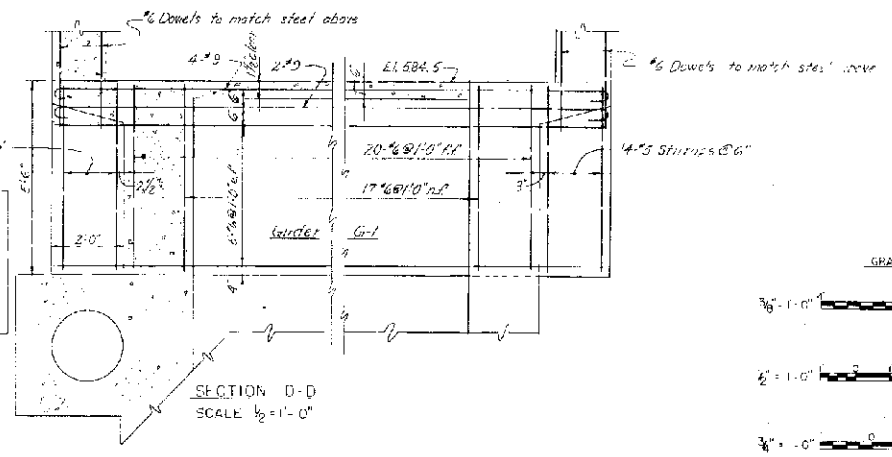
SECTION A-A
SCALE ½"=1'-0"



SECTION C-C
SCALE ¾"=1'-0"



SECTION B-B
SCALE ½"=1'-0"



SECTION D-D
SCALE ½"=1'-0"

GRAPHIC SCALES

3/8" = 1'-0"

½" = 1'-0"

3/8" = 1'-0"

GENERAL NOTES

Elevations refer to Mean Sea Level Datum.

Payment for furnishing, bending and placing of all steel reinforcement will be made under Item No. 64.

Payment for concrete, except light weight concrete, will be made under the following Item Numbers:-

Below El. 518.5	Item No. 51
Between El. 518.5 and El. 564.5	Item No. 52
Between El. 564.5 and El. 579.0	Item No. 53
Above El. 579.0	Item No. 54

Figures in hexagons indicate item numbers under which payment will be made.

Bar splices shall lap 30 diameters of the smaller bar.

All interior construction joints and all exterior construction joints below finished grade to be smooth joints. All exposed exterior construction joints below El. 581.0 shall conform to details shown on Sheet No. 34. All construction joints above El. 568.0 on the W.S. tower and above El. 590.0 on the F.C. shaft shall conform to the architectural details.

Location, number and size of dowels for equipment bases will be furnished later.

The cover for concrete reinforcement shall be 4" except as noted otherwise.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
C.C.C.	E.W.B.	J.C.D.

SUBMITTED: Chief, Design Section
PROJECT ENGINEER
RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Engineering Division

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
BASEMENT FLOOR SLAB-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: [signature] Chief, Engineering Division
DATE MARCH 1962

SCALE: AS SHOWN
SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5755
SHEET 48

MORGAN BLUE PRINT CO., BOSTON, MASS.

CORPS OF ENGINEERS — U. S. ARMY

SOUTH ELEVATION
SCALE 1/4" = 1'-0"

WEST ELEVATION
SCALE 1/4" = 1'-0"

NORTH ELEVATION
SCALE 1/4" = 1'-0"

EAST ELEVATION
SCALE 1/4" = 1'-0"

CRANE BEAM BRACKET
SCALE 3/4" = 1'-0"

SECTION A-A
SCALE 1/4" = 1'-0"

SECTION B-B
SCALE 1/4" = 1'-0"

SECTION C-C
SCALE 1/4" = 1'-0"

SECTION D-D
SCALE 1/4" = 1'-0"

SECTION E-E
SCALE 1/4" = 1'-0"

GRADING SCALES
1/4" = 1'-0"

NOTES

For general notes applying to this Sheet, see Sheet No. 49.
All diagonals shown around openings are #4 rods 3'-6" long

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.C.C. | DR. BY E.W.S. | CK. BY R.A.K.

SUBMITTED: CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVED: CHIEF, R.E. BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL—SUPERSTRUCTURE
ELEVATIONS & SECTIONS-REINFORCING DETAILS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

DATE MARCH 962

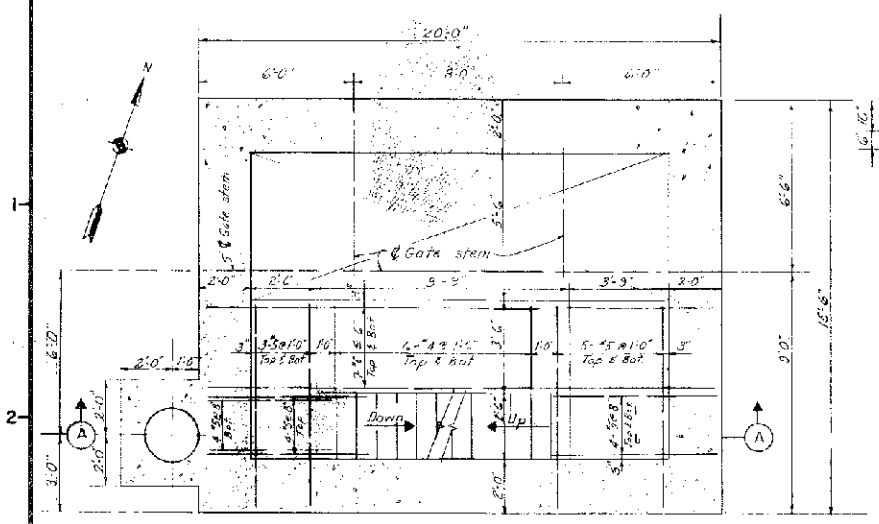
SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5756

SHEET 50

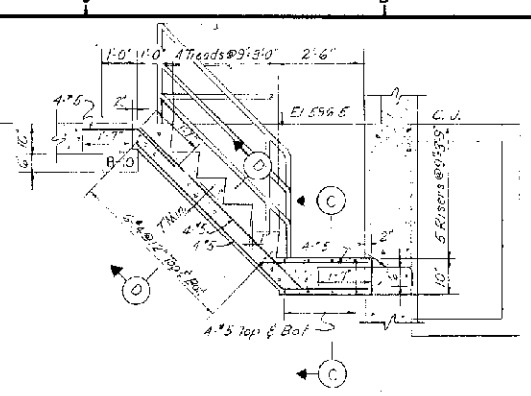
CORPS OF ENGINEERS

U. S. ARMY



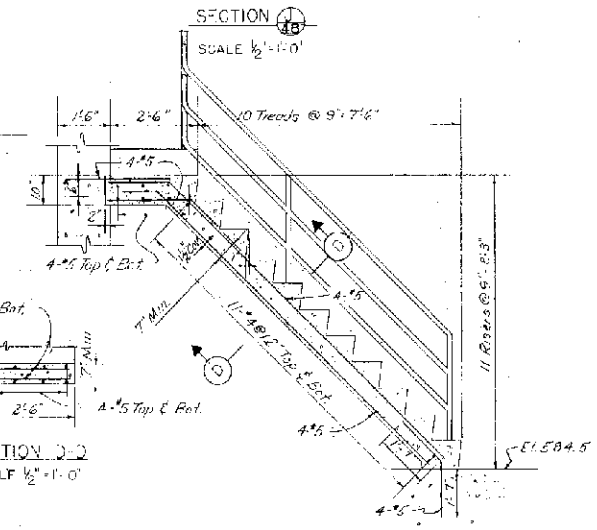
PLAN - TYPICAL GATE WELL LANDING

SCALE 3/8"=1'-0"



SECTION 4B

SCALE 1/2"=1'-0"

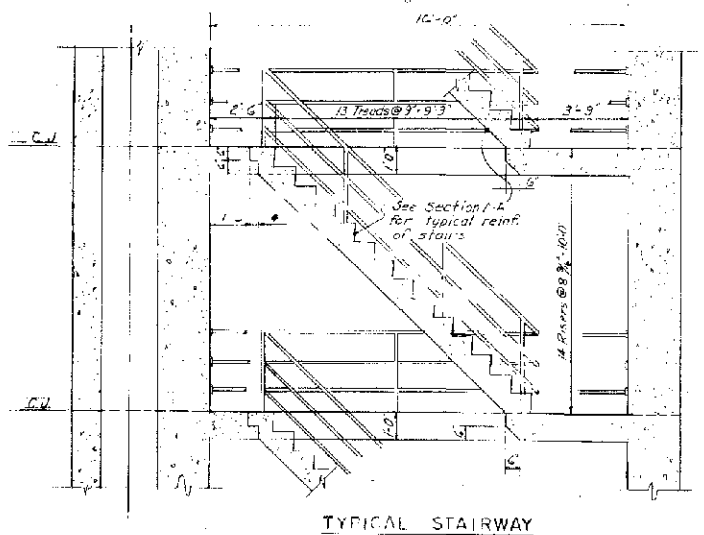


SECTION D-D

SCALE 1/2"=1'-0"

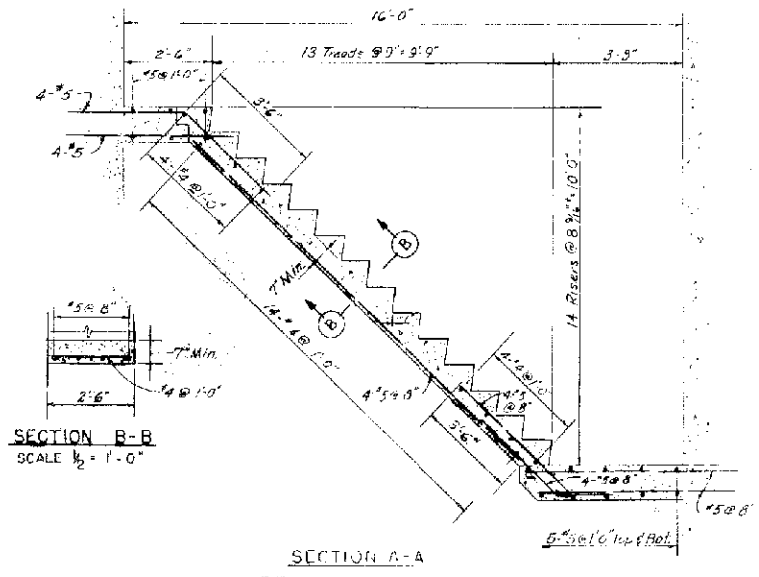
SECTION C-C

SCALE 1/2"=1'-0"



TYPICAL STAIRWAY

SCALE 3/8"=1'-0"



SECTION B-B

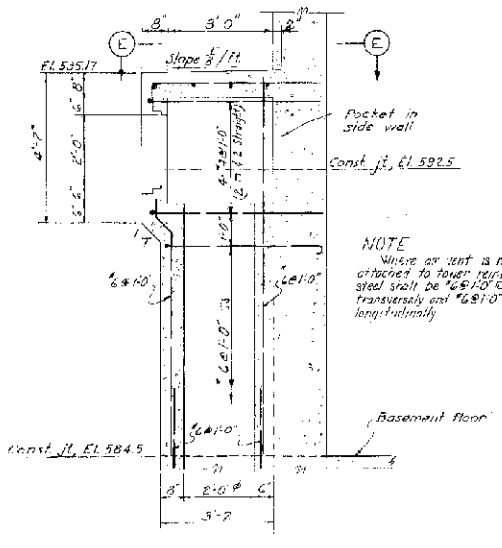
SCALE 1/2"=1'-0"

SECTION A-A

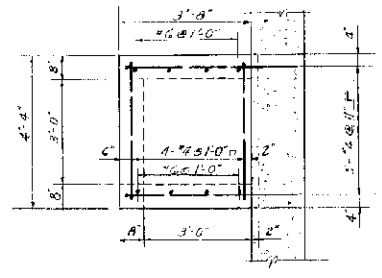
TYPICAL FOR 6 FLIGHTS

ELEV. 594.5 TO ELEV. 584.5

SCALE 1/2"=1'-0"



SECTION (Z/EC)



PLAN E-E

AIR VENT DETAILS

SCALE 1/2" = 1'-0"

GRAPHIC SCALES

3/8"=1'-0"

1/2"=1'-0"

NOTES:

For general notes applying to this sheet, see Sheet No. 48
For typical interior pipe railing details, see sheet No. 74
Payment for railing will be made under Item No. 73.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY	DR. BY	CK. BY
C.C.C.	E.W.S.	R.A.K.

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER

RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVED AND RECOMMENDED
CHIEF, E. & D. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
PLATFORM, STAIRS AND AIR VENT-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE AS SHOWN

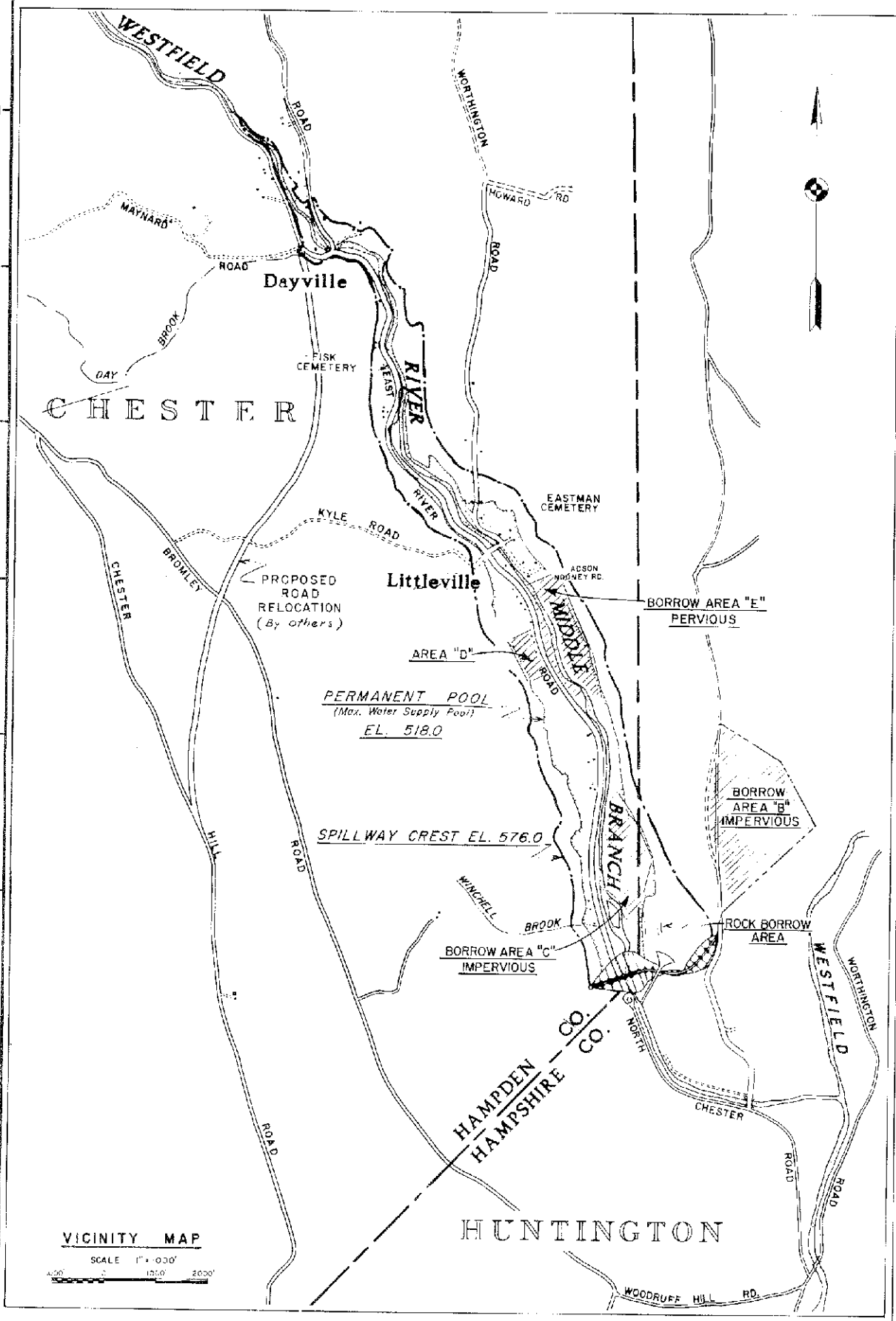
SPEC. NO. CIV. ENG. 18-016-62-49

DRAWING NUMBER
CT-1-5757

SHEET 51

MODERN BLUE PRINT CO., BOSTON, MASS.

CORPS OF ENGINEERS — U. S. ARMY

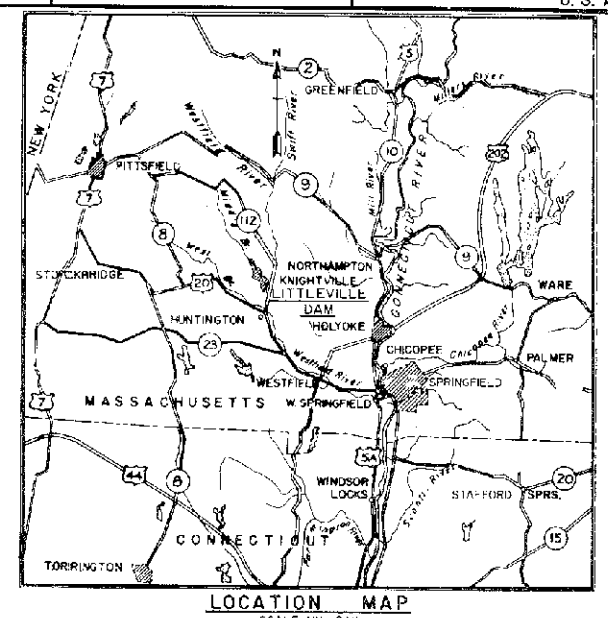


VICINITY MAP

SCALE 1" = 1000'

INDEX TO DRAWINGS

DRAWING NO.	SHEET NO.	TITLE
CT-1-5724	1	PROJECT PLAN AND INDEX
CT-1-5725	2	GENERAL PLAN
CT-1-5726	3	HYDROGRAPHS NO. 1
CT-1-5727	4	" NO. 2
CT-1-5728	5	" NO. 3
CT-1-5729	6	" NO. 4
CT-1-5730	7	" NO. 5
CT-2-1492	8	PLAN OF FOUNDATION EXPLORATIONS
CT-2-1493	9	DAM & DIKE-GEOLOGIC SECTIONS
CT-2-1494	10	CUT-OFF TRENCH-GEOLOGIC-LOG SECTION
CT-2-1495	11	WATER SUPPLY OUTLET WORKS-GEOLOGIC-LOG SECTIONS
CT-2-1496	12	FLOOD CONTROL OUTLET WORKS-GEOLOGIC-LOG SECTIONS
CT-2-1497	13	SPILLWAY-GEOLOGIC-LOG SECTIONS
CT-2-1498	14	RECORD OF FOUNDATION EXPLORATIONS-NO. 1
CT-2-1499	15	" " " " -NO. 2
CT-2-1500	16	" " " " -NO. 3
CT-2-1501	17	" " " " -NO. 4
CT-2-1502	18	" " " " -NO. 5
CT-2-1503	19	" " " " -NO. 6
CT-2-1504	20	PLAN OF BORROW EXPLORATIONS-AREA B
CT-2-1505	21	" " " " -AREAS C, D & E
CT-2-1506	22	RECORD OF BORROW EXPLORATIONS-NO. 1
CT-2-1507	23	" " " " -NO. 2
CT-2-1508	24	" " " " -NO. 3
CT-1-5731	25	EMBANKMENT SECTIONS
CT-1-5732	26	GROUTING PLAN AND DETAILS
CT-1-5733	27	LOG BOOM DETAILS
CT-1-5734	28	DAM AND DIKE PROFILES AND ROTARY DETAILS
CT-1-5735	29	DIKE SECTIONS AND ACCESS ROAD
CT-1-5736	30	PARKING AREA AND FLAG POLE DETAILS
CT-1-5737	31	SPILLWAY-PLAN AND SECTIONS
CT-1-5738	32	" -PROFILE AND SECTIONS
CT-1-5739	33	" -WEIR-SECTIONS
CT-1-5740	34	" -WEST WALL-PLAN, ELEVATIONS AND SECTIONS NO. 1
CT-1-5741	35	" " " " " " NO. 2
CT-1-5742	36	" -EAST " " " " " "
CT-1-5743	37	SPILLWAY-EAST RETAINING WALL-PLAN, ELEVATIONS AND SECTIONS
CT-1-5744	38	FLOOD CONTROL OUTLET WORKS-PLAN AND PROFILE
CT-1-5745	39	FLOOD CONTROL INTAKE STRUCTURE-CONCRETE STAIRS
CT-1-5746	40	" " " " -PLAN, SECTION AND DETAILS
CT-1-5747	41	" " " " -SECTIONS AND REINFORCING DETAILS NO. 1
CT-1-5748	42	" " " " -REINFORCING DETAILS NO. 2
CT-1-5749	43	FLOOD CONTROL TUNNEL AND TRANSITION-SECTIONS AND REINFORCING DETAILS
CT-1-5750	44	FLOOD CONTROL GATE SHAFT-ARCHITECTURAL-PLANS & ELEVATIONS
CT-1-5751	45	" " " " " " -SECTIONS & DETAILS
CT-1-5752	46	" " " " " " -ENTRANCE DETAILS
CT-1-5753	47	" " " " & WATER SUPPLY TOWER-ARCHITECTURAL-MISCELLANEOUS DETAILS
CT-1-5754	48	FLOOD CONTROL GATE SHAFT-STRUCTURAL-ROOF AND OPERATING FLOOR SLABS-REINFORCING DETAILS
CT-1-5755	49	FLOOD CONTROL GATE SHAFT-STRUCTURAL-BASEMENT FLOOR SLAB-REINFORCING DETAILS
CT-1-5756	50	" " " " -STRUCTURAL-SUPERSTRUCTURE-ELEVATIONS AND SECTIONS-REINFORCING DETAILS
CT-1-5757	51	FLOOD CONTROL GATE SHAFT-STRUCTURAL-PLATFORM, STAIRS & AIR VENT-REINFORCING DETAILS
CT-1-5758	52	" " " " -STRUCTURAL-VERTICAL & HORIZONTAL SECTIONS-REINFORCING DETAILS
CT-1-5759	53	FLOOD CONTROL OUTLET WORKS-STRUCTURAL-MISCELLANEOUS METALS DETAILS
CT-1-5760	54	" " GATE SHAFT-AIR VENTS & ACCESSORIES
CT-1-5761	55	" " " " -MECHANICAL-PLANS, SECTIONS & DETAILS
CT-1-5762	56	" " " " " " -GATE ASSEMBLY & MISCELLANEOUS DETAILS
CT-1-5763	57	" " " " -ELECTRICAL-PLANS & SECTIONS
CT-1-5764	58	FLOOD CONTROL OUTLET PORTAL-PLAN & SECTIONS
CT-1-5765	59	" " " " -SECTIONS
CT-1-5766	60	WATER SUPPLY AND SERVICE BRIDGE-PLAN & PROFILE
CT-1-5767	61	WATER SUPPLY INTAKE TOWER-PLAN & SECTIONS
CT-1-5768	62	" " " " -RETAINING WALLS
CT-1-5769	63	" " " " -ARCHITECTURAL-PLAN & DETAILS
CT-1-5770	64	" " " " " " -ELEVATION & SECTION
CT-1-5771	65	" " " " " " -ENTRANCE DETAILS
CT-1-5772	66	" " " " -STRUCTURAL-ROOF & OPERATING FLOOR SLABS-REINFORCING DETAILS
CT-1-5773	67	" " " " -STRUCTURAL HEATER ROOM & GATE WELL FLOOR SLABS-REINFORCING DETAILS
CT-1-5774	68	WATER SUPPLY INTAKE TOWER-STRUCTURAL-SUPERSTRUCTURE-ELEVATIONS & SECTIONS-REINFORCING DETAILS
CT-1-5775	69	WATER SUPPLY INTAKE TOWER-STRUCTURAL-PLATFORM & STAIRS-REINFORCING DETAILS
CT-1-5776	70	" " " " " " -BASE SLAB & WALL-REINFORCING DETAILS
CT-1-5777	71	" " " " " " -VERTICAL SECTIONS NO.1
CT-1-5778	72	" " " " " " " " NO.2
CT-1-5779	73	" " " " & E.C. GATE SHAFT MISCELLANEOUS METALS-DETAILS NO. 1
CT-1-5780	74	" " " " & E.C. GATE SHAFT-STRUCTURAL-MISCELLANEOUS METALS-DETAILS NO. 2
CT-1-5781	75	" " " " -MECHANICAL-PLANS & SECTIONS
CT-1-5782	76	" " " " " " -GATE ASSEMBLIES & MISCELLANEOUS DETAILS
CT-1-5783	77	" " " " -ELECTRICAL-PLANS & SECTIONS
CT-1-5784	78	" " " " -FLOAT WELL & ACCESSORIES
CT-1-5785	79	" " " " -TILE GAGES
CT-1-5786	80	WATER SUPPLY CONDUIT-PLAN & SECTIONS NO. 1
CT-1-5787	81	" " " " " " NO. 2
CT-1-5788	82	" " " " " " NO. 3
CT-1-5789	83	WATER SUPPLY OUTLET PORTAL-PLAN & SECTIONS



LOCATION MAP

SCALE 1IN.=8 MI.

INDEX CONTINUED

DRAWING NO.	SHEET NO.	TITLE
CT-1-5790	84	ELECTRICAL DISTRIBUTION SYSTEM-PLAN & ONE LINE DIAGRAM
CT-1-5791	85	" " " " -MISCELLANEOUS DETAILS NO. 1
CT-1-5792	86	" " " " " " NO. 2
CT-1-5793	87	ACCESS BRIDGE ABUTMENTS-PLAN & DETAILS
CT-1-5794	88	ACCESS BRIDGE-STRUCTURAL STEEL DETAILS NO. 1
CT-1-5795	89	" " " " " " NO. 2
CT-1-5796	90	ACCESS & SERVICE BRIDGES-STRUCTURAL-BEARING & ABUTMENT DETAILS
CT-1-5797	91	SERVICE BRIDGE-STRUCTURAL STEEL DETAILS NO. 1
CT-1-5798	92	" " " " " " NO. 2
CT-1-5799	93	" " " " -STRUCTURAL-PIERS & ABUTMENT DETAILS
CT-1-5800	94	GOSS HILL ROAD IMPROVEMENT-PLAN & PROFILE NO. 1
CT-1-5801	95	" " " " " " NO. 2
CT-1-5802	96	" " " " " " NO. 3
CT-1-5803	97	" " " " " " NO. 4
CT-1-5804	98	MAINTENANCE ROAD-PROFILE, SECTIONS & DETAILS
CT-1-5805	99	UTILITY BUILDING-SITE PLAN
CT-1-5806	100	" " -PLANS, SECTIONS & DETAILS
CT-1-5807	101	" " -ELEVATIONS & DETAILS
CT-1-5808	102	" " -SECTIONS & DETAILS
CT-1-5809	103	" " -STRUCTURAL DETAILS
CT-1-5810	104	" " -PLUMBING & HEATING
CT-1-581	105	" " -ELECTRICAL-PLAN & SECTIONS
CT-1-5812	106	OPERATORS QUARTERS-SITE PLAN
CT-1-5813	107	" " -FLOOR PLANS, ELEVATIONS & SECTIONS
CT-1-5814	108	" " -FRAMING PLANS, SECTIONS & DETAILS
CT-1-5815	109	" " -ELECTRICAL PLAN
CT-1-5816	110	" " -PLUMBING & HEATING
CT-1-5817	111	GARAGE-PLANS, ELEVATIONS, SECTIONS & DETAILS

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY | DR. BY | CK. BY

PROJECT ENGINEER

APPROVED & RECOMMENDED — CHIEF, ENGINEERING DIVISION

APPROVED — CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
PROJECT PLAN AND INDEX

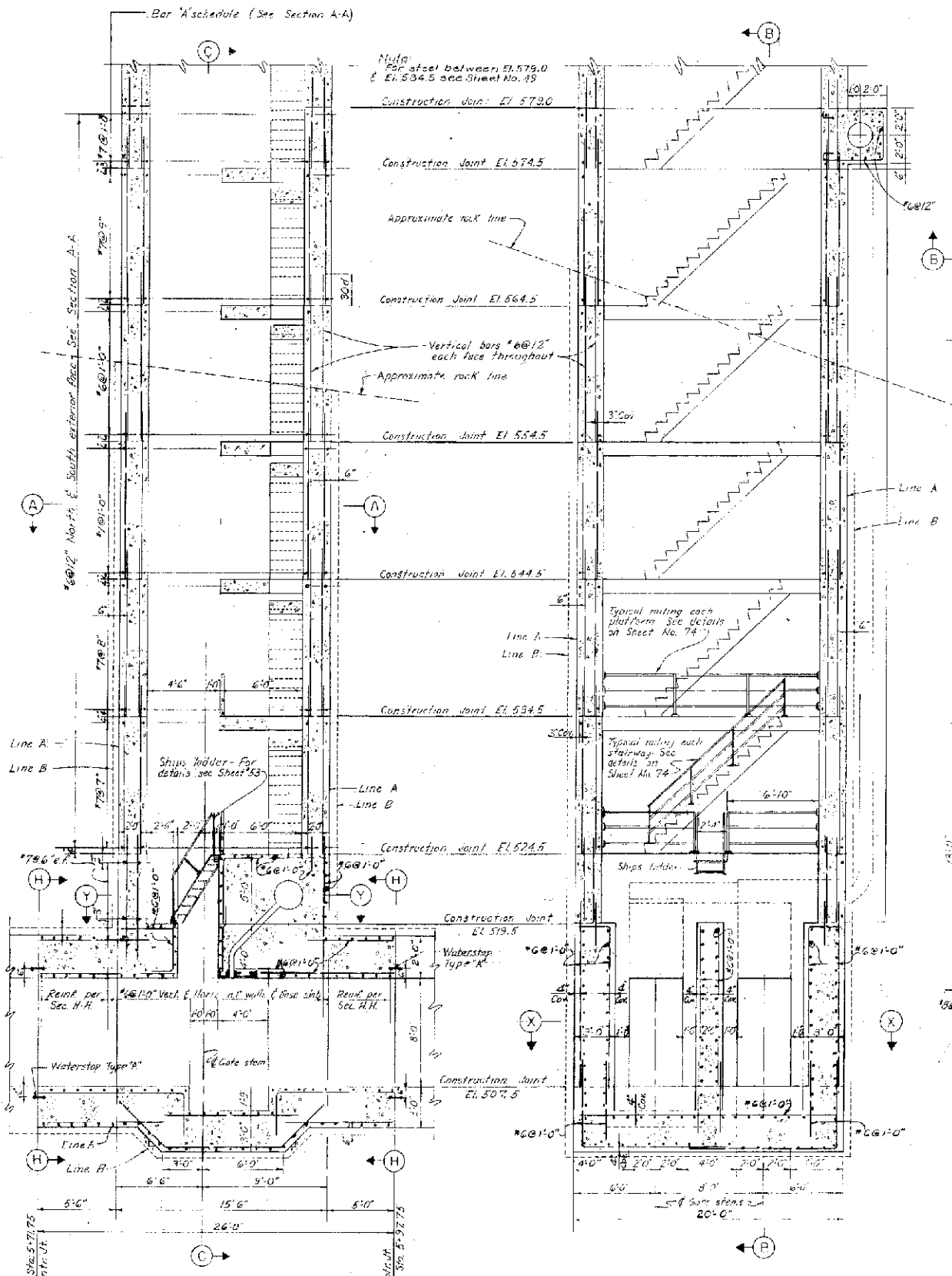
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-216-62-171

DRAWING NUMBER
CT-1-5724

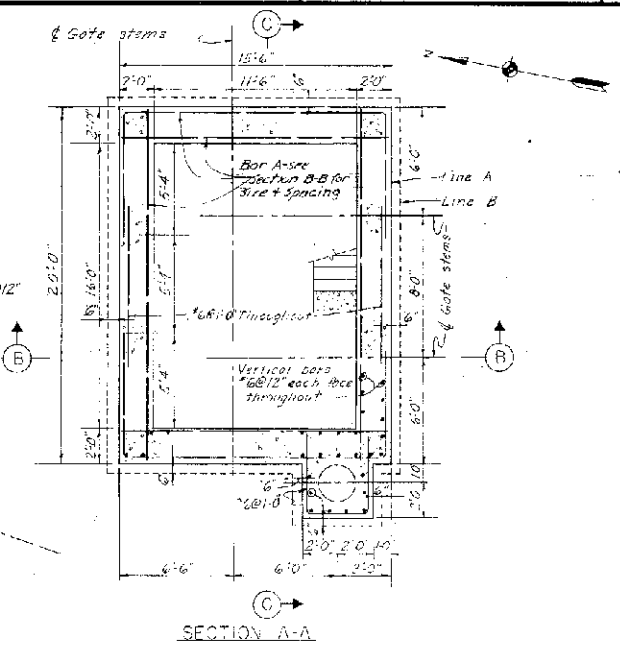
SHEET 1

CORPS OF ENGINEERS — U.S. ARMY

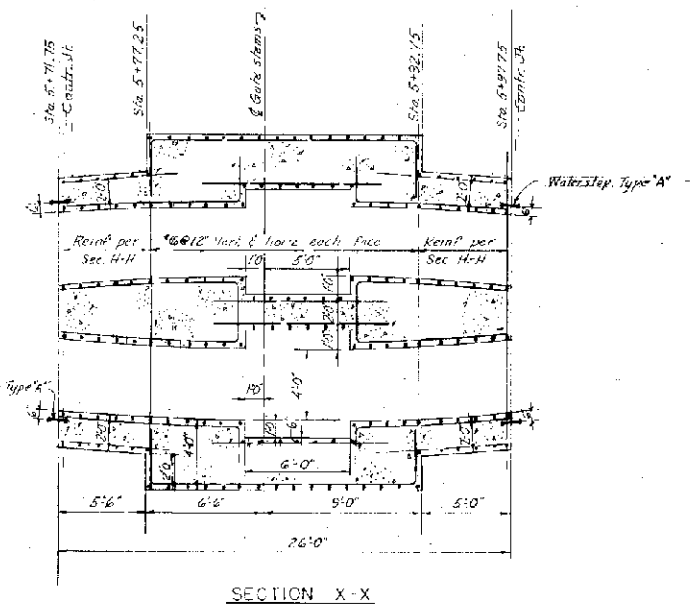


SECTION B-B
SCALE 1/4"-1'-0"

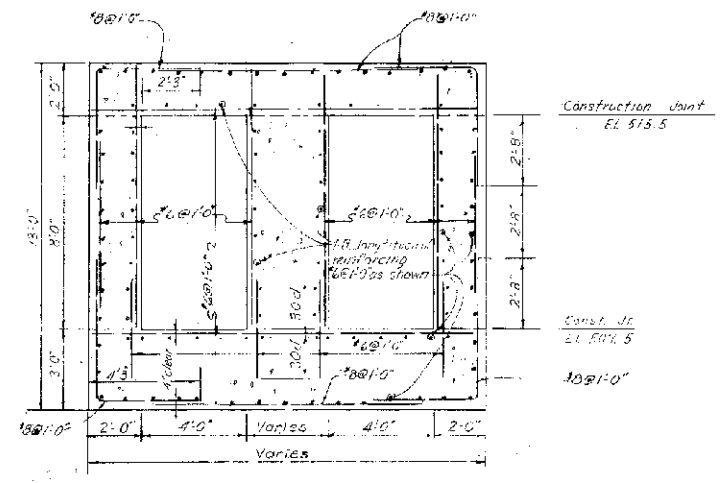
SECTION C-C
SCALE 1/4"=1'-0"



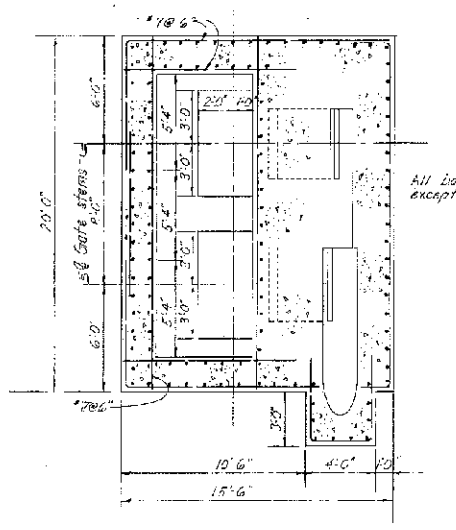
SECTION A-A
SCALE 1/4"-1'-0"



SECTION X-X
SCALE 1/4"-1'-0"



SECTION H-H
AT STA. 5+71.75 AND AT STA. 5+97.75
SCALE 3/8"=1'-0"



SECTION Y-Y
SCALE 1/4"=1'-0"

NOTE
For general notes see Sheet No. 49
For contraction joint detail at Sec. H-H see Sheet No. 80

GRAPHIC SCALES
1/4"-1'-0"
3/8"=1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
C.C.C.	E.W.S.	W.F.W.

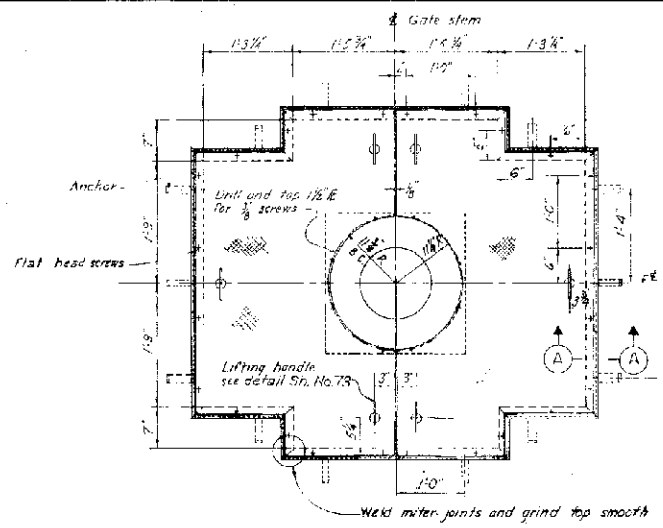
SUBMITTED: W. F. White, CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: CHIEF, E & A BRANCH
APPROVED: CHIEF ENGINEERING DIVISION
DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
STRUCTURAL
VERTICAL & HORIZONTAL SECTIONS-REINF. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

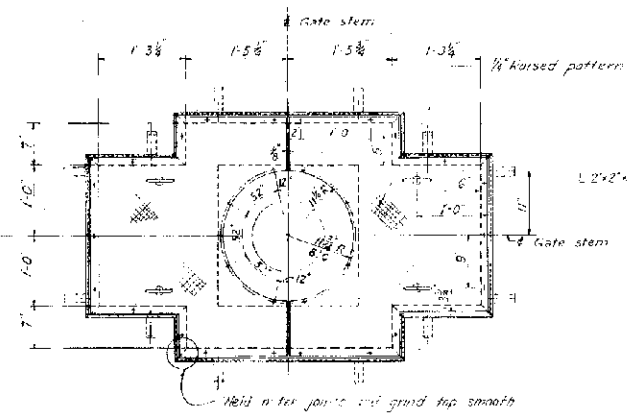
SCALE AS SHOWN | SPEC. NO. CIV. ENG 19-018-62-49
DRAWING NUMBER
CT-1-5758
SHEET 52

MODERN BLUE PRINT CO., BOSTON, MASS.

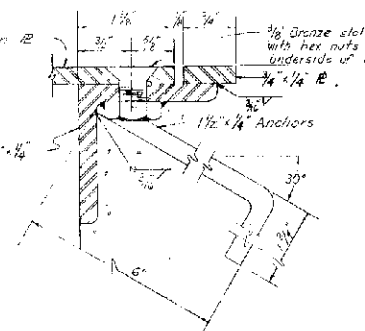
CORPS OF ENGINEERS — U. S. ARMY



WEST FRAME & COVER



EAST FRAME & COVER



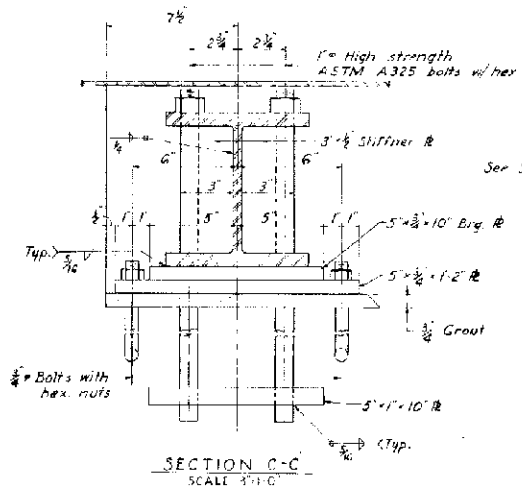
SECTION A-A

SECTION E-E SIMILAR OMIT SCREW & NUT

SCALE FULL SIZE

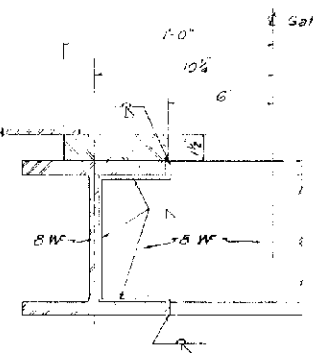
PLAN GATEWELL FRAMES AND COVERS AT HOIST SUPPORTS

SCALE 1"=1'-0"



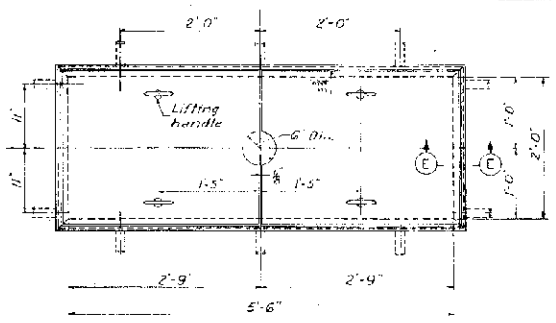
SECTION C-C

SCALE 1"=1'-0"



SECTION D-D

SCALE 3"=1'-0"

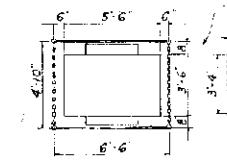


PLAN

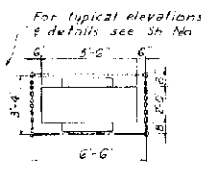
FRAME & COVER, WEST SHAFT, BASEMENT FLOOR

FRAME & COVER, EAST SHAFT, SAME

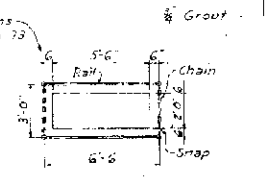
SCALE 1"=1'-0"



PLAN-WEST GATE WELL OPERATING FLOOR



PLAN-EAST GATE WELL



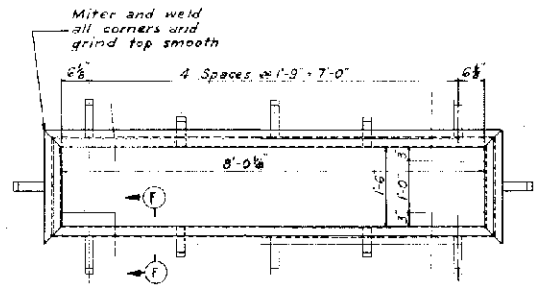
PLAN-EAST & WEST GATE WELLS BASEMENT FLOOR

PORTABLE HATCHWAY GUARDS

SCALE ¼"=1'-0"

SECTION B-B

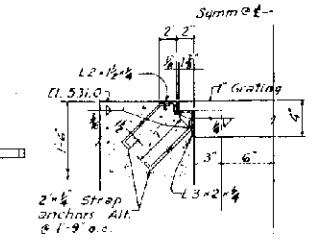
SCALE 3"=1'-0"



FRAME

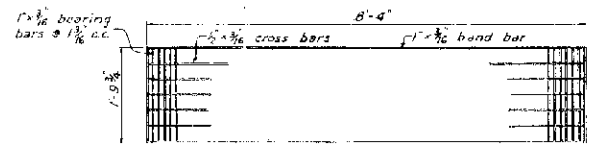
2 REQUIRED

SCALE ¾"=1'-0"



SECTION F-F

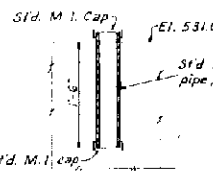
SCALE 1½"=1'-0"



GRATING

2 REQUIRED

SCALE ¾"=1'-0"



HOIST SOCKET

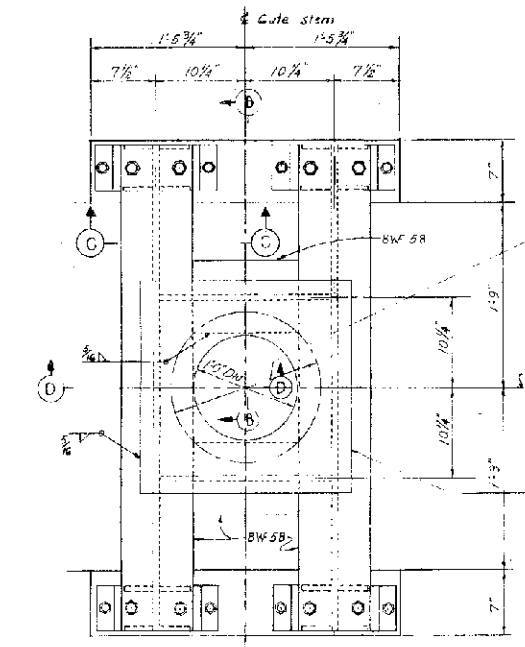
3 REQUIRED

SCALE 1"=1'-0"

(73)

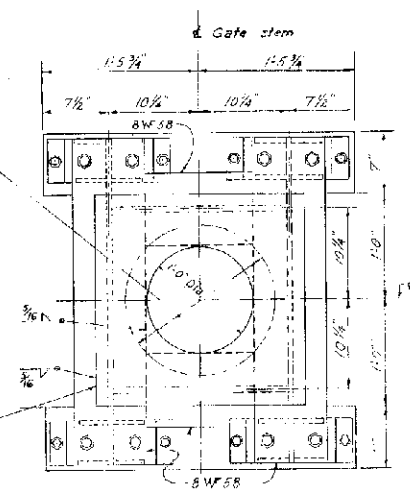
GRATING AND FRAME FOR STOP LOG SLOT

INTAKE STRUCTURE PLATFORM EL. 531.0



PLAN WEST HOIST SUPPORT

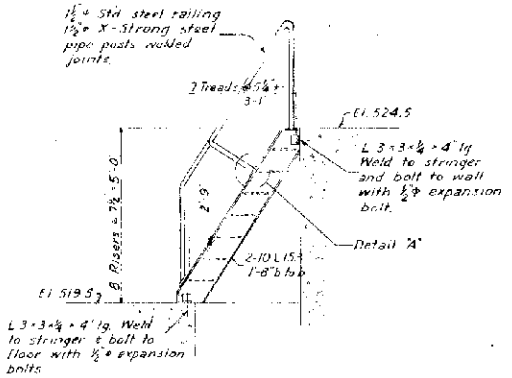
SCALE 1½"=1'-0"



PLAN EAST HOIST SUPPORT

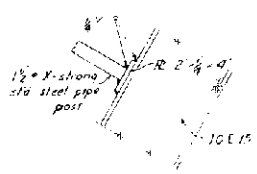
SCALE 1½"=1'-0"

Brg ℓ and anchor bolt sizes and details same as for west hoist support



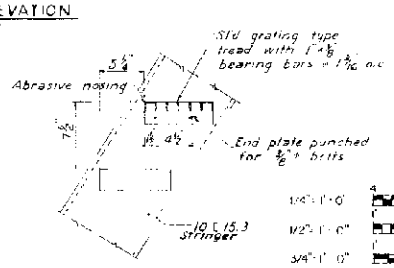
SHIPS LADDER ELEVATION

SCALE ½"=1'-0"



DETAIL "A"

SCALE 1½"=1'-0"



TYPICAL TREAD DETAIL

SCALE 1½"=1'-0"

GRAPHIC SCALES

1/4"=1'-0"
1/2"=1'-0"
3/4"=1'-0"
1"=1'-0"
1 1/2"=1'-0"
3"=1'-0"

NOTE:

All steel shown on this sheet will be paid for under Item No. 74 with the exception of pipe railing which will be paid for under Item No. 73.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY C.E.C. | DR. BY E.W.S. | CH. BY

SUBMITTED: CHIEF, STRUCT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET WORKS
STRUCTURAL
MISCELLANEOUS METALS DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

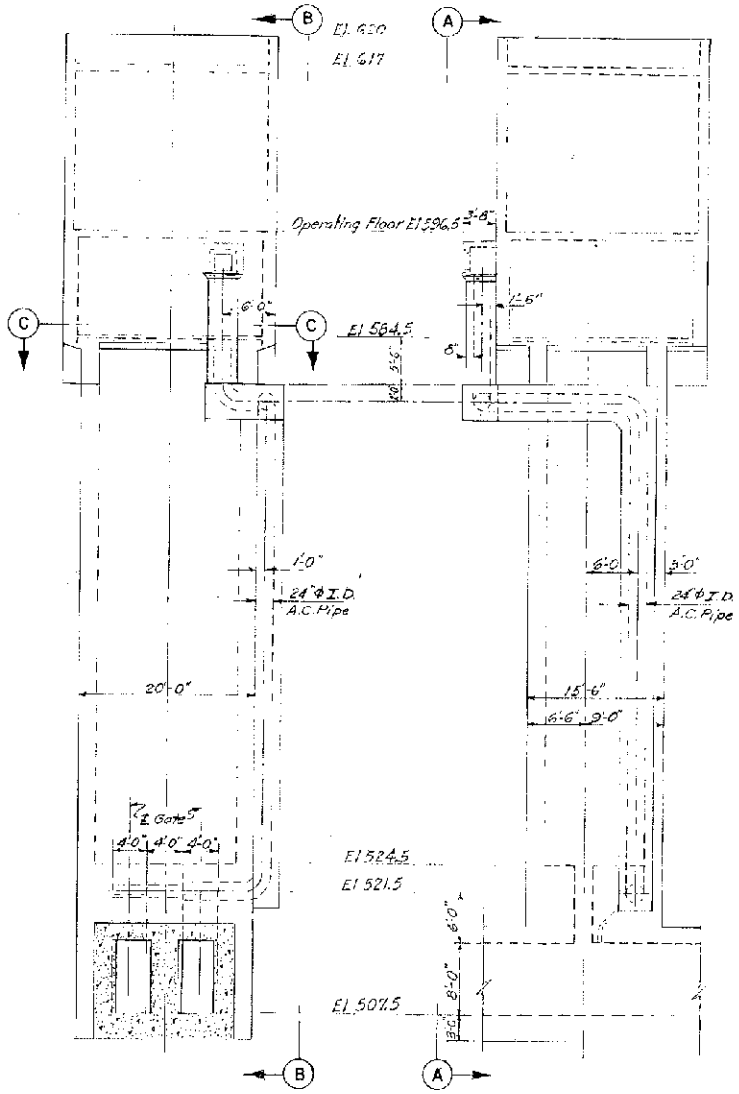
APPROVED: CHIEF, ENGINEERING DIVISION — DATE: MARCH 1962

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5759

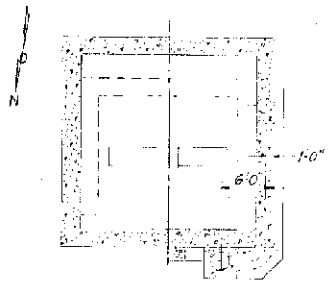
SHEET 53

CORPS OF ENGINEERS — U.S. ARMY

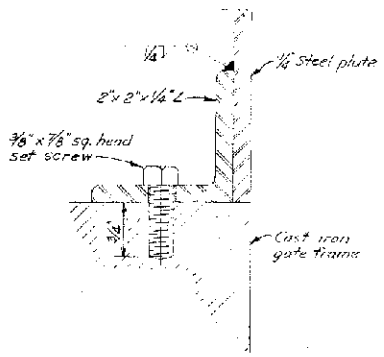


SECTION A-A
SCALE: 1/8"=1'-0"

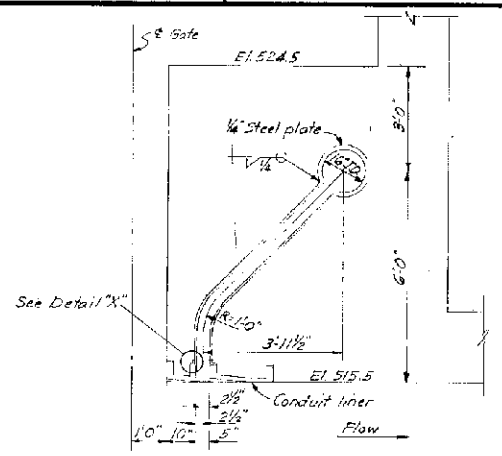
SECTION B-B
SCALE: 1/8"=1'-0"



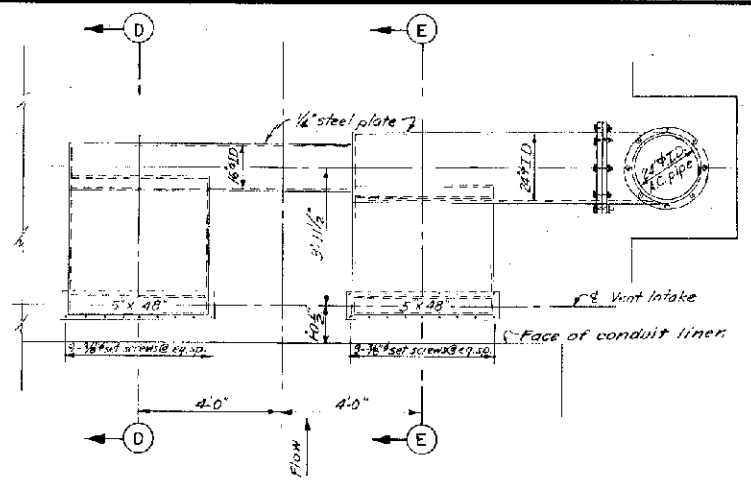
SECTION C-C
SCALE: 1/8"=1'-0"



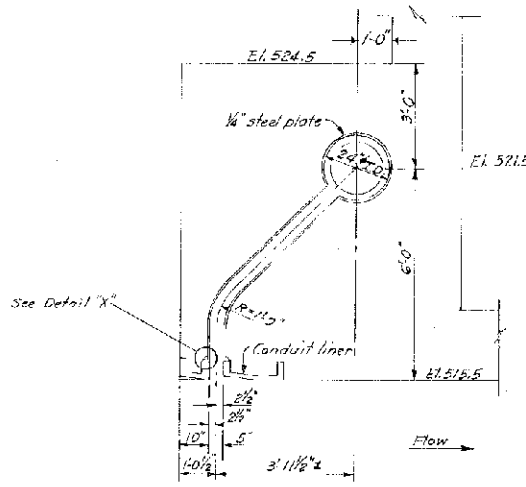
DETAIL "X"
FULL SIZE



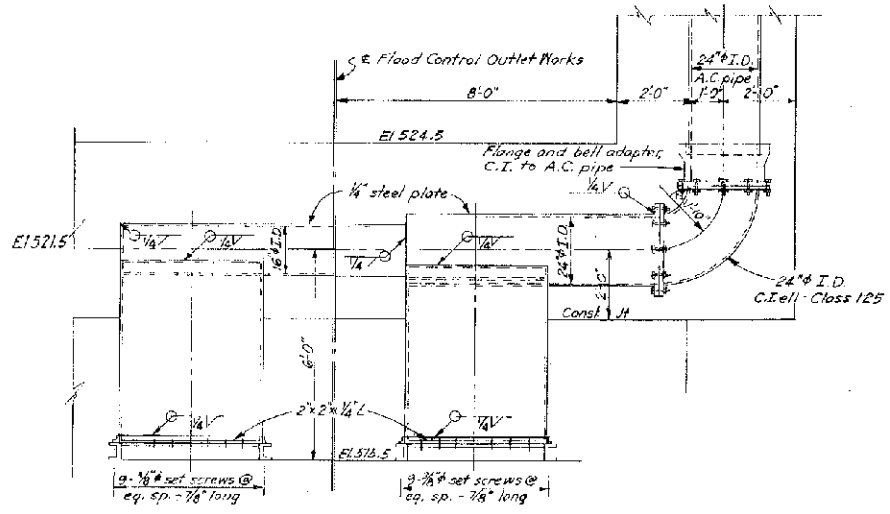
SECTION D-D
SCALE: 1/2"=1'-0"



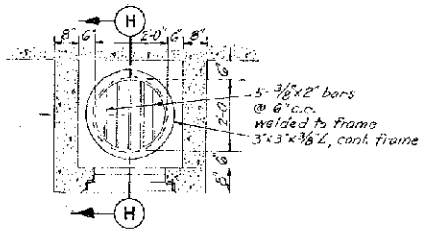
PLAN
SCALE: 1/2"=1'-0"



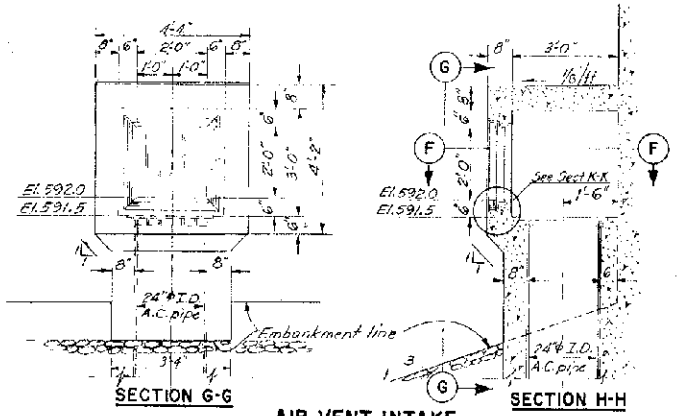
SECTION E-E
SCALE: 1/2"=1'-0"



ELEVATION
SCALE: 1/2"=1'-0"



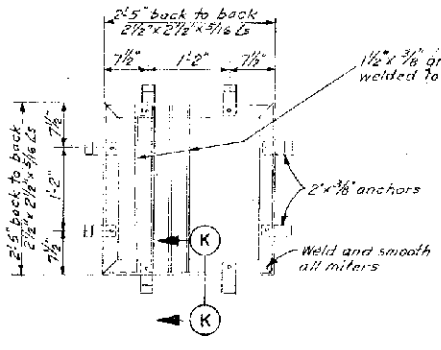
SECTION F-F



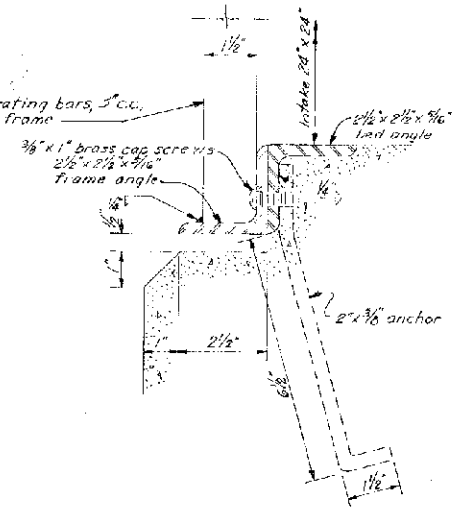
SECTION G-G

SECTION H-H

AIR VENT INTAKE
SCALE: 1/2"=1'-0"



AIR VENT GRILL
SCALE: 1"=1'-0"



SECTION K-K
SCALE: 6"=1'-0"

NOTES
Elevations refer to Mean Sea Level Datum
Air Vents and Accessories will be paid for under Item No. 71
For concrete reinforcement see Sheet No. 50

GRAPHIC SCALES
1/8"=1'-0"
1/2"=1'-0"
1"=1'-0"
6"=1'-0"
FULL SIZE

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P.H.	K.H.W.	J.H.

PROJECT ENGINEER: [signature]

APPROVAL RECOMMENDED: [signature] CHIEF, ENGINEERING DIVISION

APPROVED: [signature] CHIEF, ENGINEERING DIVISION

DATE: MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
AIR VENTS AND ACCESSORIES
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5760

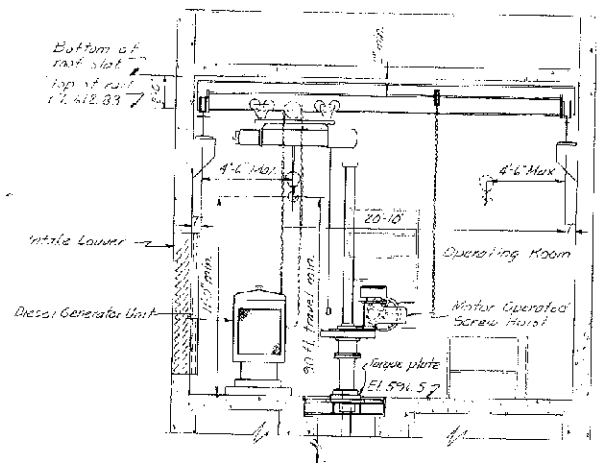
SHEET 54

CORPS OF ENGINEERS

U. S. ARMY

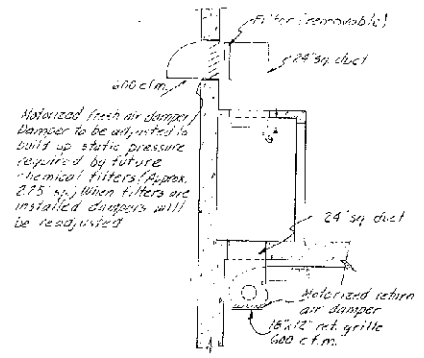
SECTION A-A

SCALE 1/4" = 1'-0"



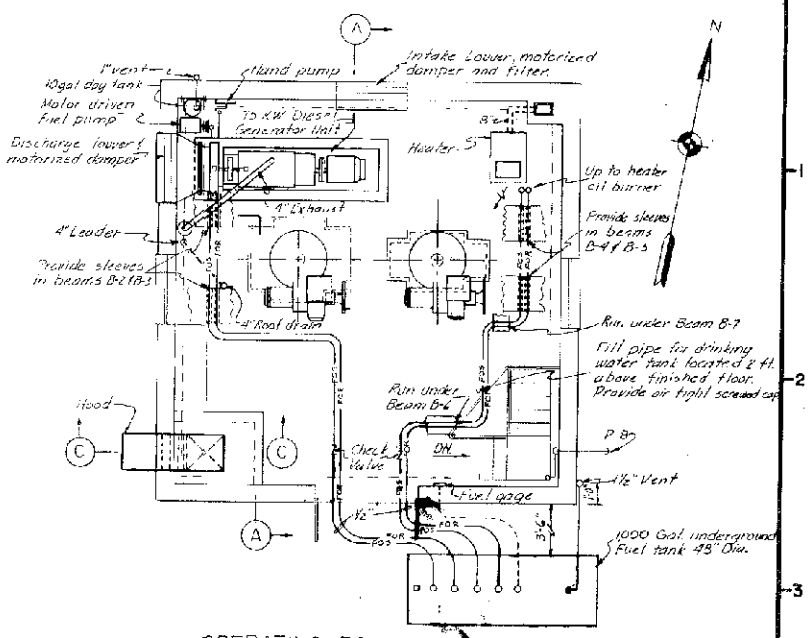
SECTION A-A-CONT.

SCALE: 1/4" = 1'-0"



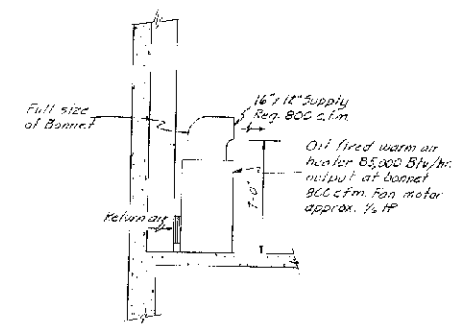
SECTION C-C

SCALE: 1/4" = 1'-0"



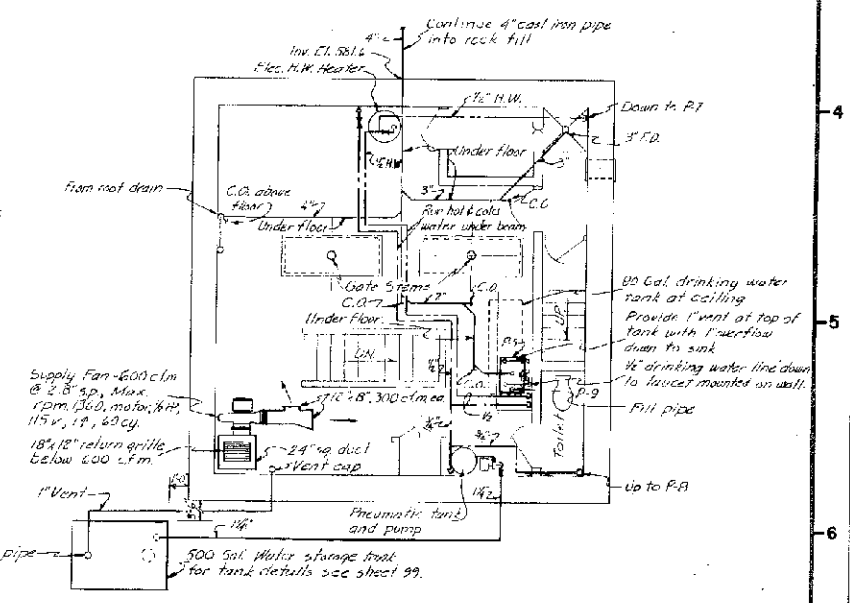
OPERATING ROOM FLOOR PLAN

SCALE 1/4" = 1'-0"



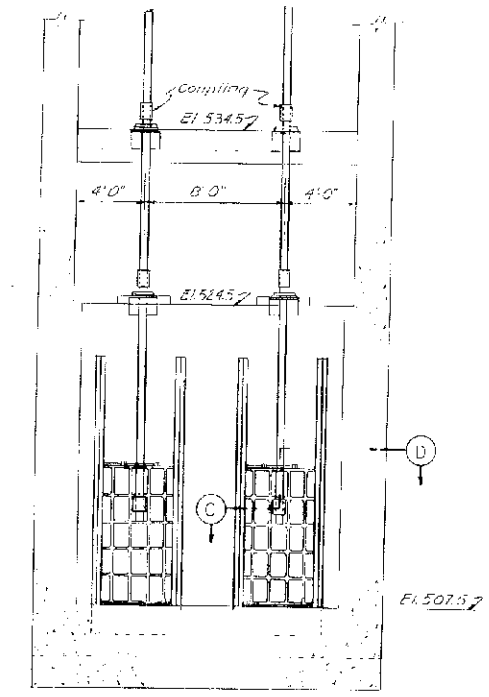
WARM AIR HEATER DETAIL

SCALE 1/4" = 1'-0"



BASEMENT FLOOR PLAN

SCALE: 1/4" = 1'-0"



SECTION B-B

SCALE: 1/4" = 1'-0"

NOTES:

All work, materials and equipment in connection with the Heating and Ventilating System, as specified, will be paid for under Item No. 78.

All work, materials and equipment in connection with the Gates and accessories, as specified, will be paid for under Item No. 79.

All work, materials and equipment in connection with the Traveling Crane, as specified, will be paid for under Item No. 80.

All work, materials and equipment in connection with the Diesel Electric Generating Set, as specified, will be paid for under Item No. 81.

All work, materials and equipment in connection with the Plumbing System, as specified, will be paid for under Item No. 68.

All work, materials and equipment in connection with the 500 Gallon Water Storage Tank, as specified will be paid for under Item No. 100.

GRAPHIC SCALE

1/4" = 1'-0"

4' 0 4' 8'

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY U.T.S. | DR. BY N.R.C. | CK. BY

CHIEF, DESIGN BRANCH

CHIEF, R & M BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
MECHANICAL
PLANS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED

CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE- AS SHOWN

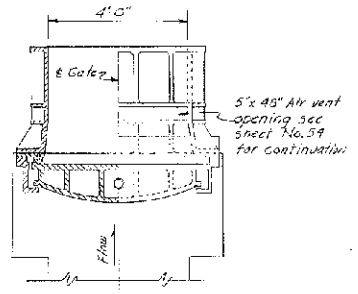
SPEC. NO. CIV. ENG-19-012-6045

DRAWING NUMBER
CT-1-5761

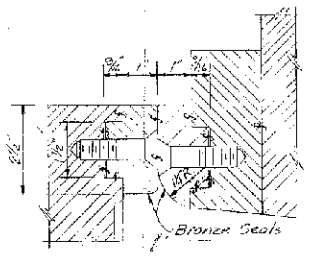
SHEET 55

HUGHES BLUE PRINT CO., BOSTON, MASS.

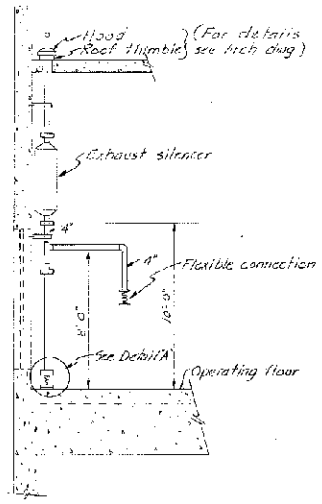
CORPS OF ENGINEERS — U. S. ARMY



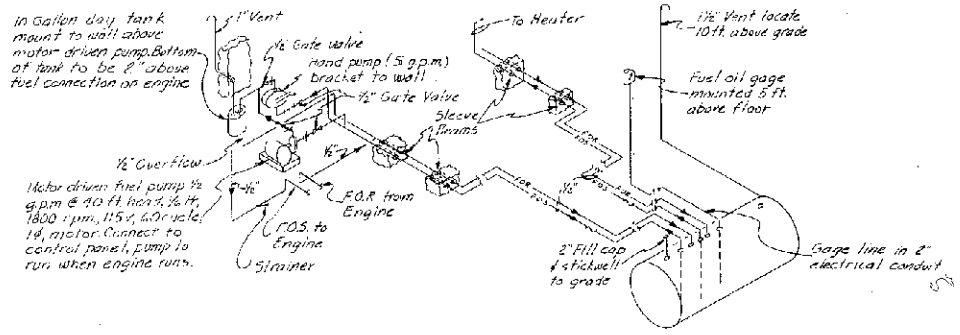
PLAN
SECTION C/55 . SECTION D/55
SCALE 1/2" = 1'-0"



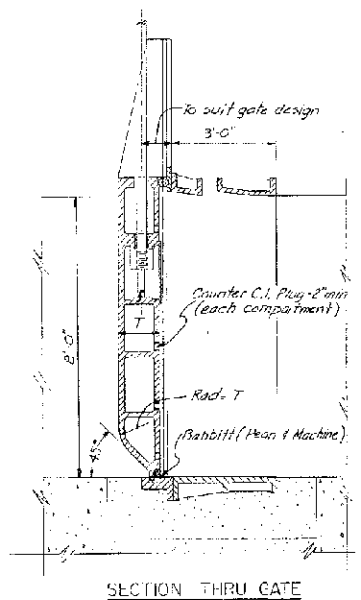
DETAIL "B"
SCALE: 1/2" = 1"



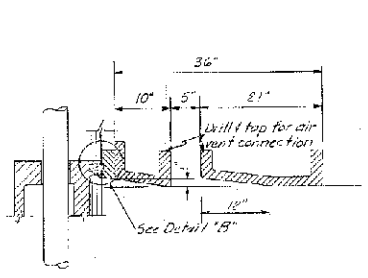
DETAIL OF ENGINE EXHAUST PIPING
SCALE: 1/4" = 1'-0"



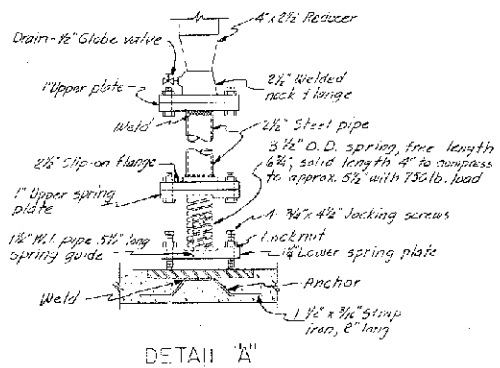
FUEL PIPING DIAGRAM
NOT TO SCALE



SECTION THRU GATE
SCALE: 1/2" = 1'-0"



DETAIL - CONDUIT LINER
SCALE 1" = 1'-0"



DETAIL "A"
NOT TO SCALE

GATE ASSEMBLY DETAILS
SCALE: AS SHOWN

NOTES:

All work materials, and equipment in connection with the Gates and Accessories, as specified, will be paid for under Item No. 79. All work materials and equipment in connection with the Diesel Electric Generating Set, as specified, will be paid for under Item No. 81.

GRAPHIC SCALES

1/4" = 1'-0"
1/2" = 1'-0"
1" = 1'-0"
1/2" = 1"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

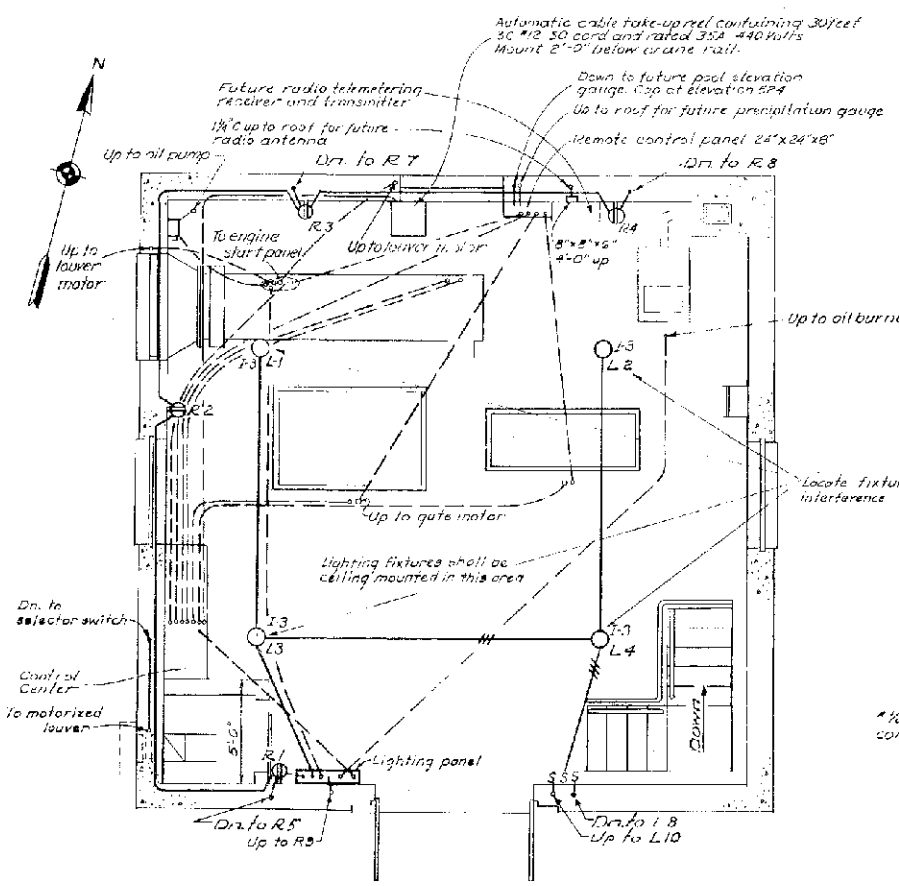
DES. BY C.T.S. | DR. BY J.P.M. | CK. BY R.S.C.
SUBMITTED: Chief, Mech. Section
PROJECT ENGINEER
APPROVAL RECOMMENDED: Chief, Design Branch
APPROVAL RECOMMENDED: Chief, P & C Branch

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
MECHANICAL
GATE ASSEMBLY AND MISC. DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: Chief, Engineering Division
DATE: MARCH 902

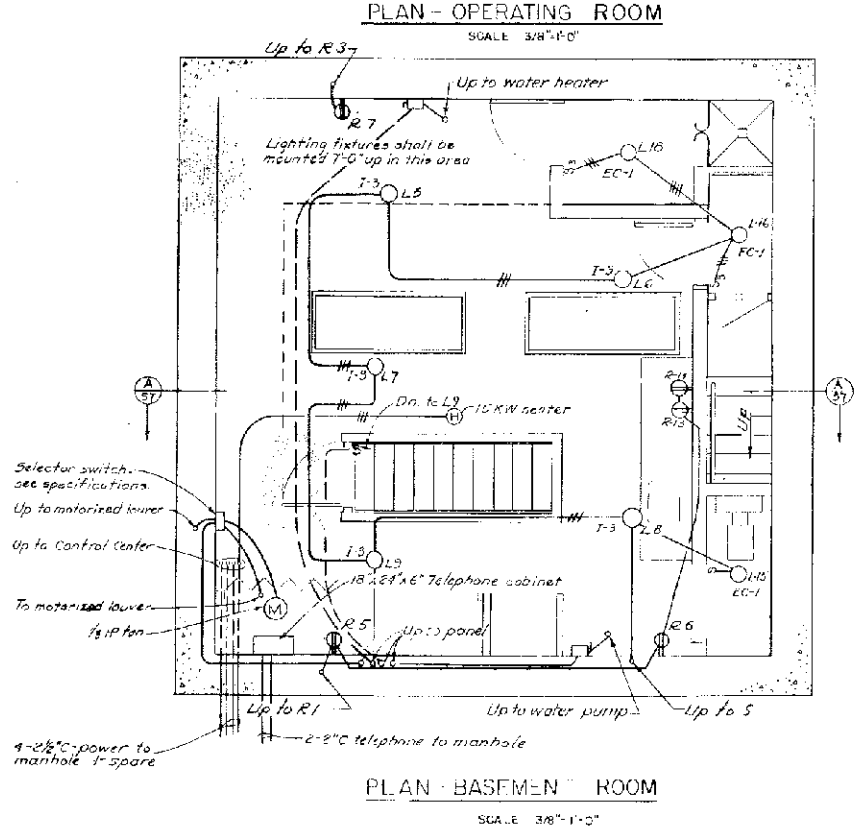
SCALE
SPEC. NO. DIV. ENG. U.S. CE, 2701
DRAW. NO. NUMBER
CT-1-5762
SHEET 56

CORPS OF ENGINEERS — U. S. ARMY



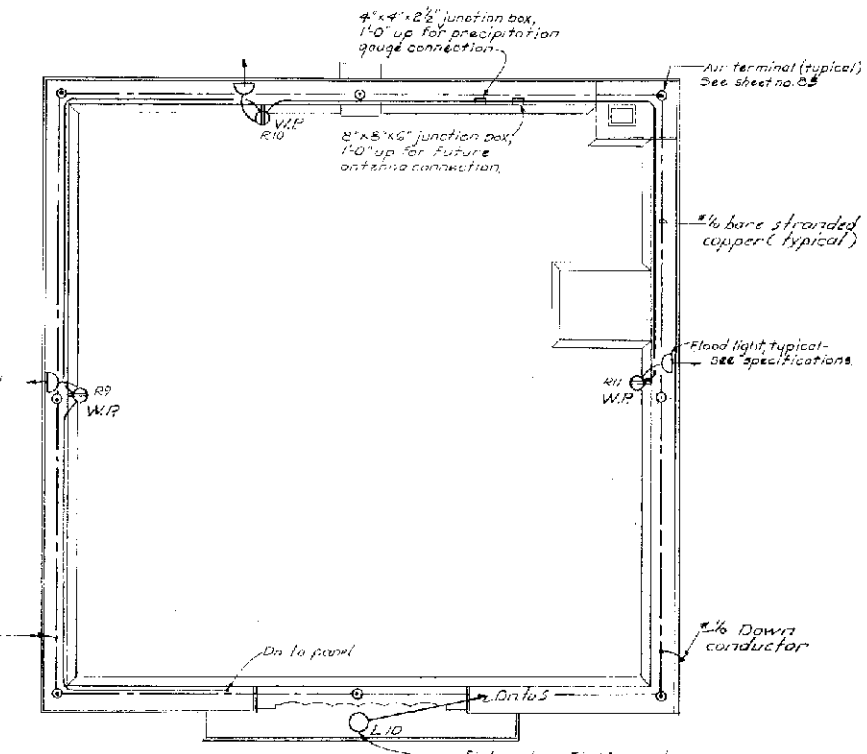
PLAN - OPERATING ROOM

SCALE 3/8"=1'-0"



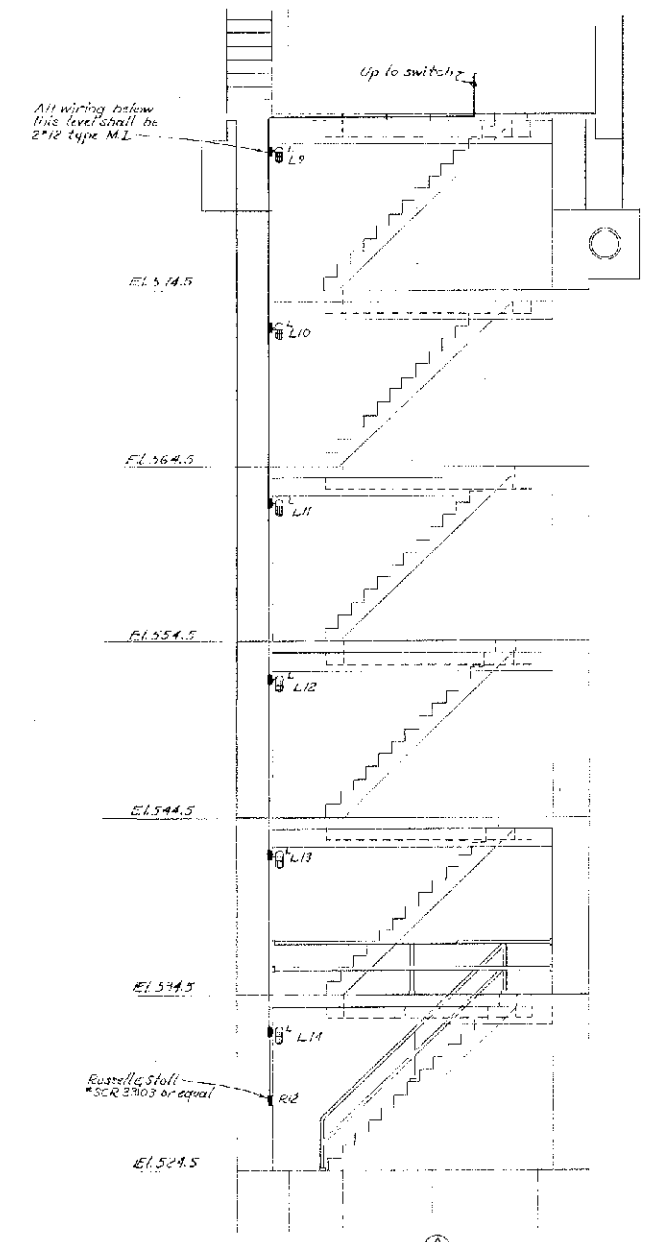
PLAN - BASEMENT ROOM

SCALE 3/8"=1'-0"



ROOF PLAN

SCALE 3/8"=1'-0"



SECTION A/S7

SCALE 1/4" = 1'-0"

NOTES-

All receptacles and wall switches shall be mounted 4'-0" above the floor. For symbols see Drawing No. 40-06-04, Sheet No. 1 in the specifications. Electrical work in the flood control gate shaft will be paid for under Item 62.

V	A
W	F

V. Keg — Running Time Indicator

	30A-2P Lighting Trans.	30A-3P Space Heater
	30A-3P Crane	60A. Utility Bldg.
	100A-3P Gate Motor #1	
	100A-3P Gate Motor #2	
	100A-3P Water Supply Intake Tower	
	100A-3P Spare	
10 KVA Transformer	(*) 200A-3P Red Power On Pilot Light. Incoming Line	150A 600V-3Ø Transfer Switch
	200A-3P Emergency Generator	
Battery Charger	60A2P Lighting Panel	30A-1P Battery Charger

CONTROL CENTER

FRONT VIEW

SCALE 1" = 1'-0"

LIGHTING PANEL

120/240 V., S/N, 3-WIRE
1Ø, 100A. MAINS-LUGS ONLY

CIR. NO.	BRANCH FUSE AMP. SIZE	NO. POLES	SERVES	CONN. LOAD WATTS
1	20	1	Lights-operating room	800
2			Lights-Shelter room	1200
3			Lights-stairwell	900
4			Floodlights	1500
5			Receptacles R1, R5, R6, R13, R14	500
6			Receptacles R2, R3, R4, R7, R8	500
7			Water heater	1600
8			Waterpump #1	500
9			Oil pump & louvers	500
10			Oil burner	500
11			Fan	350
12			Spare	—
			TOTAL	8,150

NOTES-

All receptacles and wall switches shall be mounted 4'-0" above the floor. For symbols see Drawing No. 40-06-04, sheet 1 in the specifications.

GRAPHIC SCALES

3/8" = 1'-0"

½" = 1'-0"

1" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY V.A.D. | DR. BY J.B.M. | CK. BY R.P.L.

SUBMITTED: CHIEF, ELECT. SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED: CHIEF, E & M BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL GATE SHAFT
ELECTRICAL
PLANS AND SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: OCT 1962

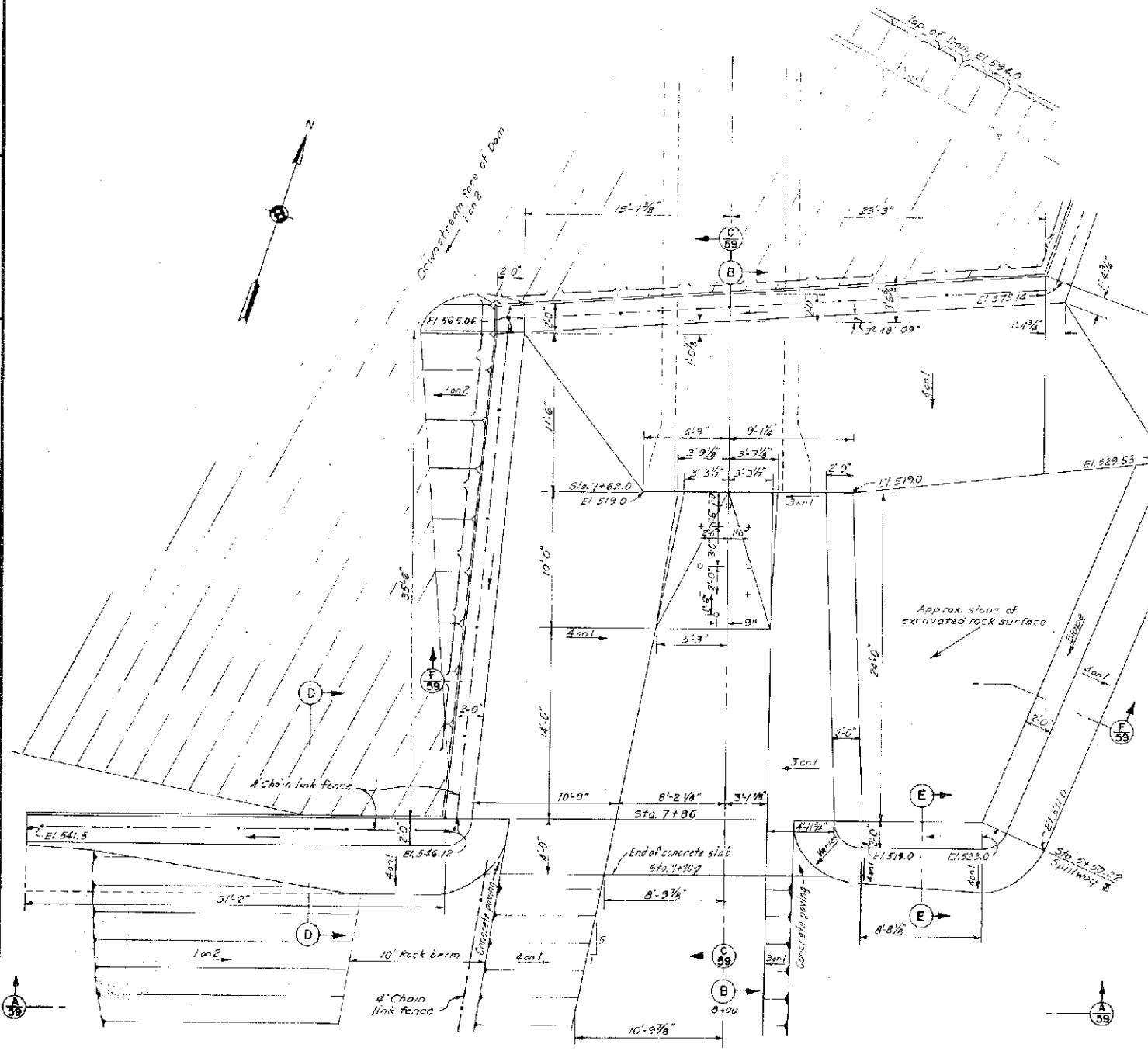
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-119

DRAWING NUMBER
CT-1-5763

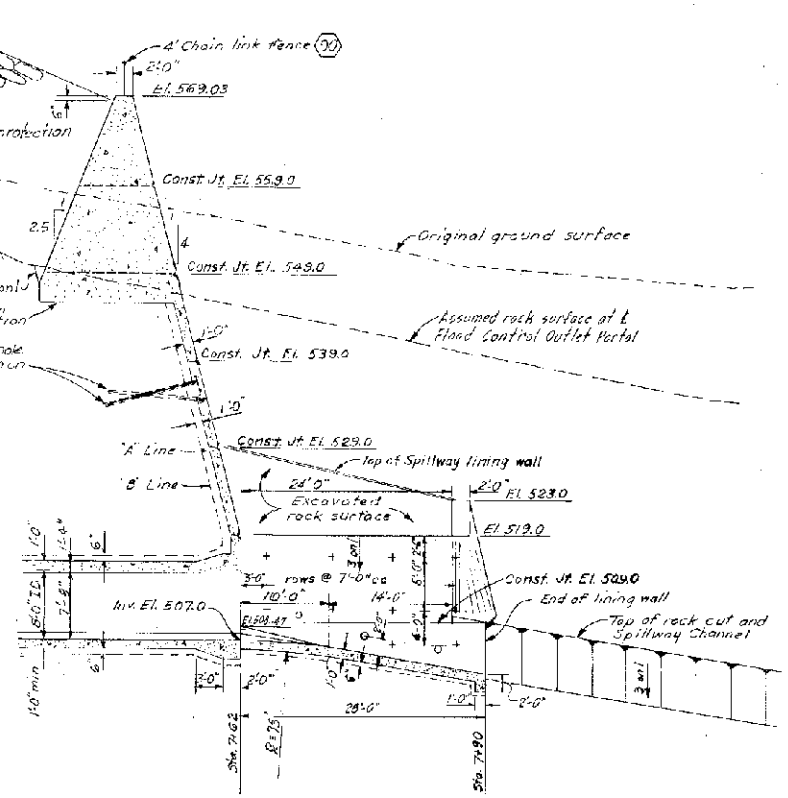
SHEET 51

NEW ENGLAND BLUE PRINT CO., BOSTON, MASS.

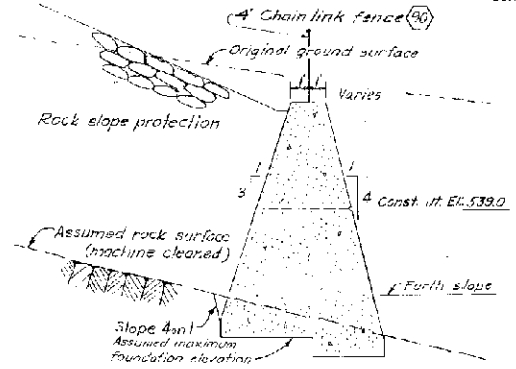
CORPS OF ENGINEERS — U. S. ARMY



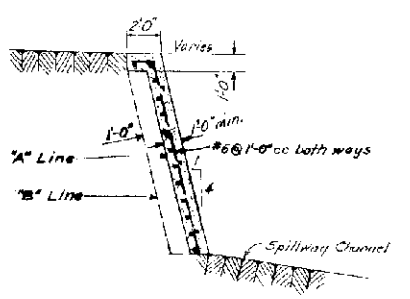
PLAN
SCALE: 1/4" = 1'-0"



SECTION B-B
SCALE: 1/8" = 1'-0"



SECTION D-D
SCALE: 1/4" = 1'-0"



SECTION E-E
SCALE: 1/4" = 1'-0"

NOTES

Elevations refer to mean sea level datum.
For details of type "B" anchors see Sheet No. 34 and 42.
For details of drains see Sheet No. 42.
For details of structural joints see Sheet No. 34.
Line "A" indicates minimum thickness of concrete.
Line "B" indicates payment line for rock excavation and concrete.
Concrete in tunnel lining to be paid for under Item No. 60.
Concrete in outlet portal retaining walls will be paid for under Item No. 45.
Concrete in lining will be paid for under Item No. 46.
Payment for furnishing, bending and placing of all steel reinforcement will be made under Item No. 64.
Figures in hexagons indicate item number under which payment will be made.

GRAPHIC SCALES
1/8" = 1'-0" — 4' 0 4' 8' 12' 16' 20'
1/4" = 1'-0" — 4' 0 4' 8'
1" = 4' — 4' 0 4' 8'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

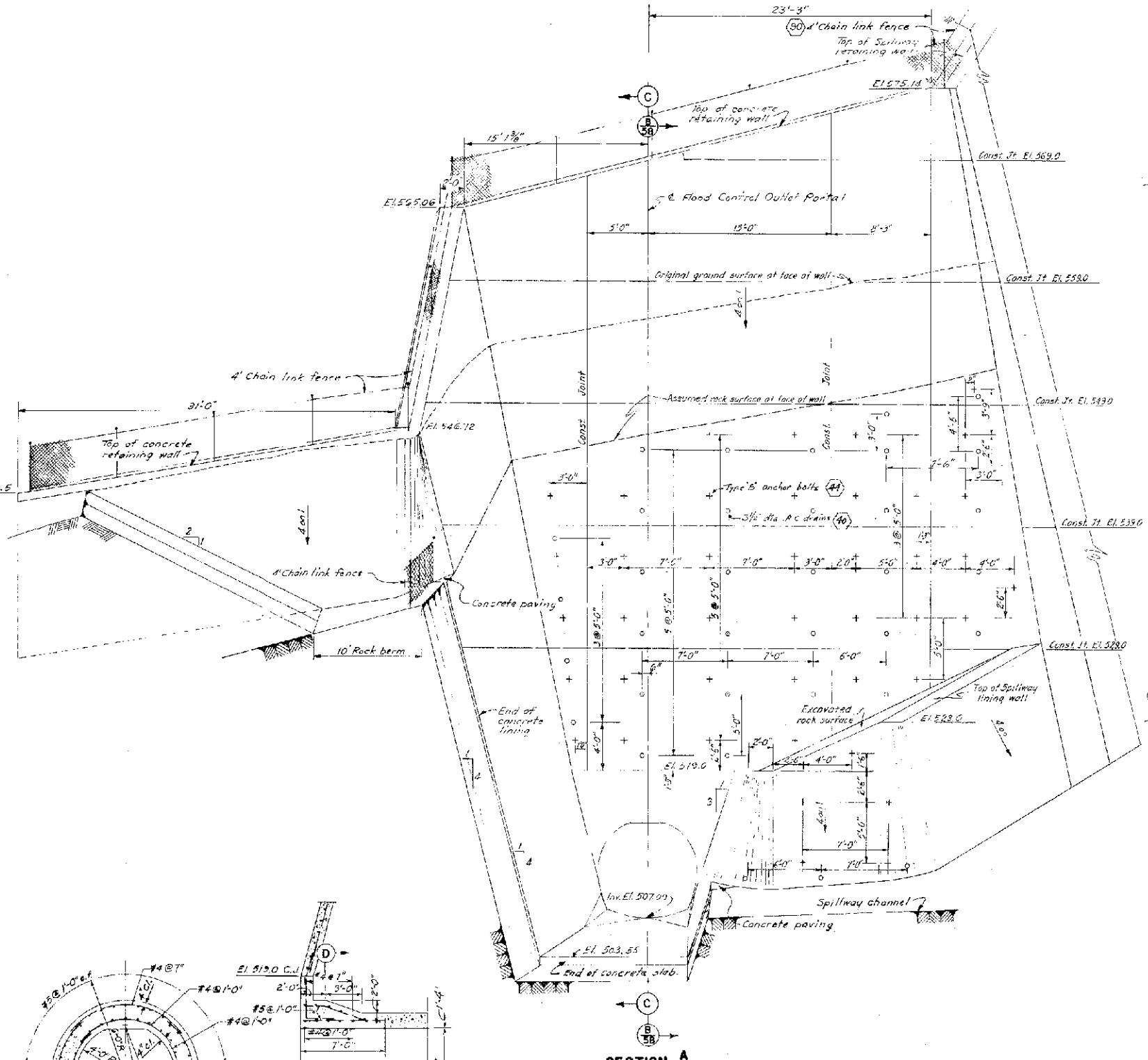
DES. BY	DR. BY	CK. BY
L.J.B	K.H.W	W.W.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET PORTAL
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

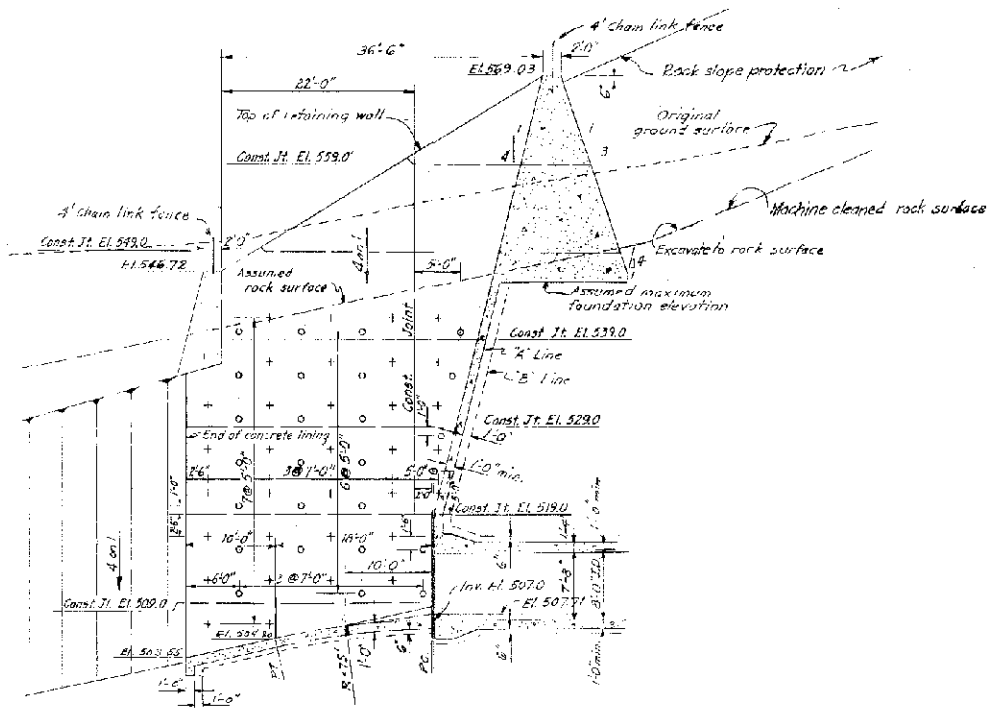
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, E & D BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-95
DRAWING NUMBER
CT-1-5764
SHEET 58

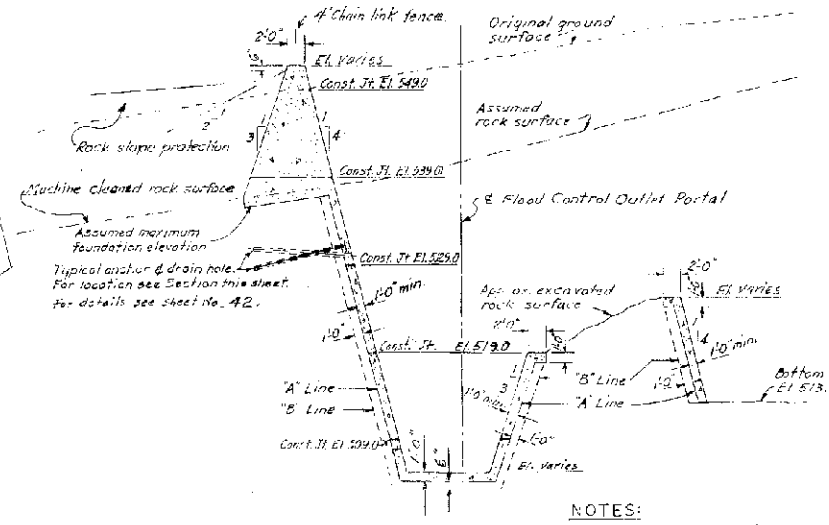
CORPS OF ENGINEERS — U. S. ARMY



SECTION A 58
SCALE: 1/4" = 1'-0"

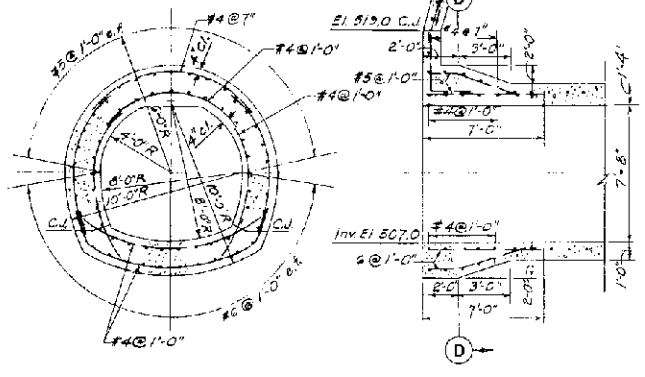


SECTION C-C B C/58
SCALE: 1/8" = 1'-0"



SECTION F 58
SCALE: 1/8" = 1'-0"

NOTES:
For general notes applying to this sheet, see Sheet No. 52.
Figures in hexagons indicate Item Nos. under which payment will be made.
All concrete lining to be reinforced with #6 bars, 1'-0" O.C. both ways. For detail see Sheet No. 54.
For General Notes applying to steel reinforcement see Sheet No. 49



SECTION D-D
SCALE: 1/4" = 1'-0"

SECTION AT OUTLET
SCALE: 1/4" = 1'-0"

GRAPHIC SCALES
1/8" = 1'-0"
1/4" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	CR. BY	CK. BY
L.J.S.	K.H.W.	

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET PORTAL
SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

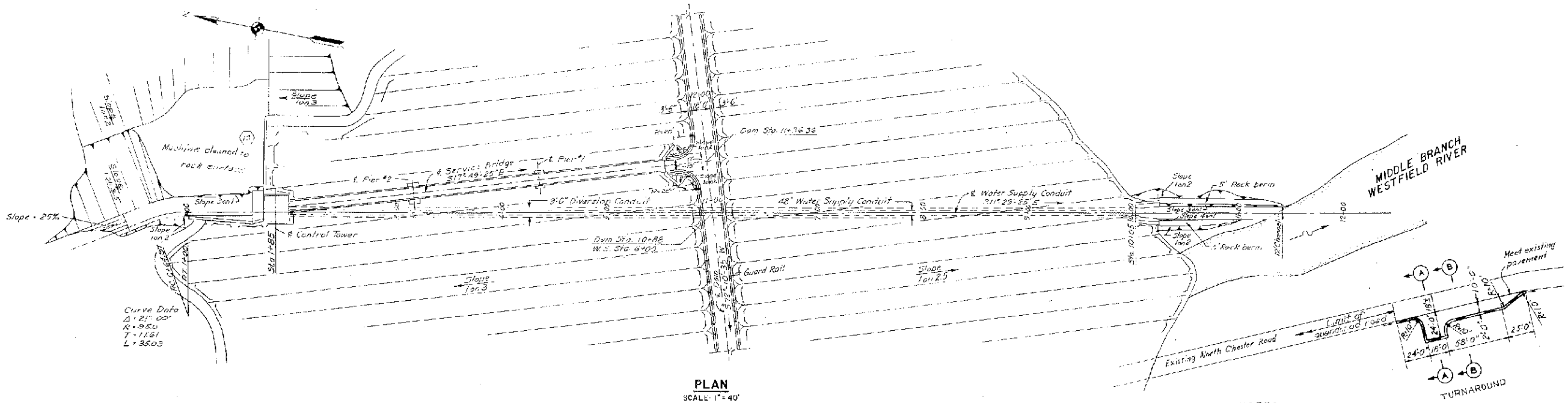
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-45

DRAWING NUMBER
CT-1-5765

SHEET 39

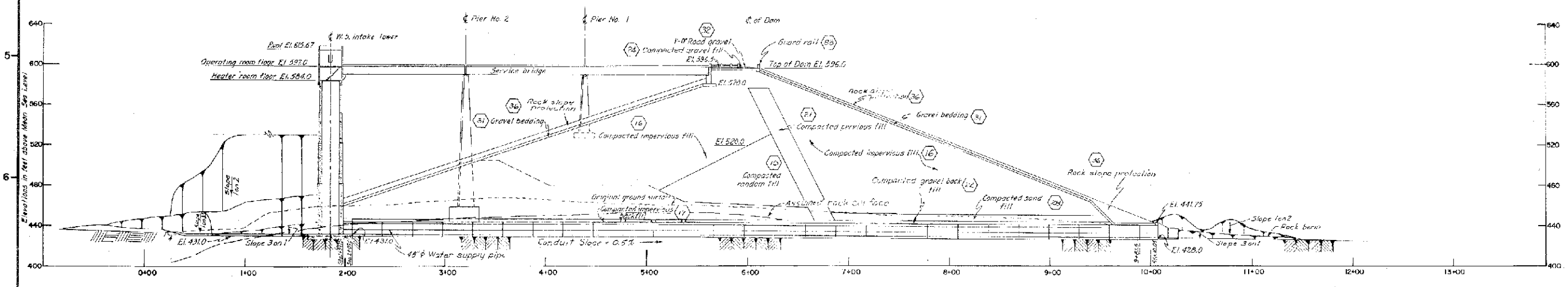
CORPS OF ENGINEERS — U. S. ARMY



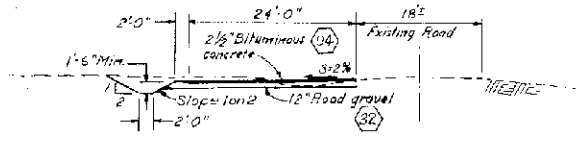
PLAN
SCALE: 1" = 40'

NOTES

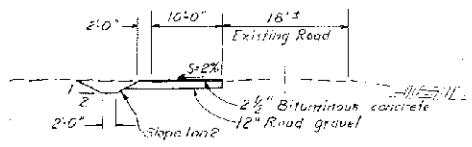
All elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate item numbers under which payment will be made.
For embankment Sections see Sheet No. 25
For Service Bridge Plan & Details see Sheet Nos. 91 to 93



PROFILE ALONG ℄ CONDUIT
SCALE: 1" = 40'



SECTION A-A
SCALE 1" = 10'-0"



SECTION B-B
SCALE 1" = 10'-0"

GRAPHIC SCALE
1" = 40' 0 40 80
1" = 10' 0 10 20

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. | DR. BY K.R.W. | CK. BY R.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, E. & D. BRANCH

APPROVED
CHIEF, ENGINEERING DIV. (SGN)

DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY & SERVICE BRIDGE
PLAN AND PROFILE
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

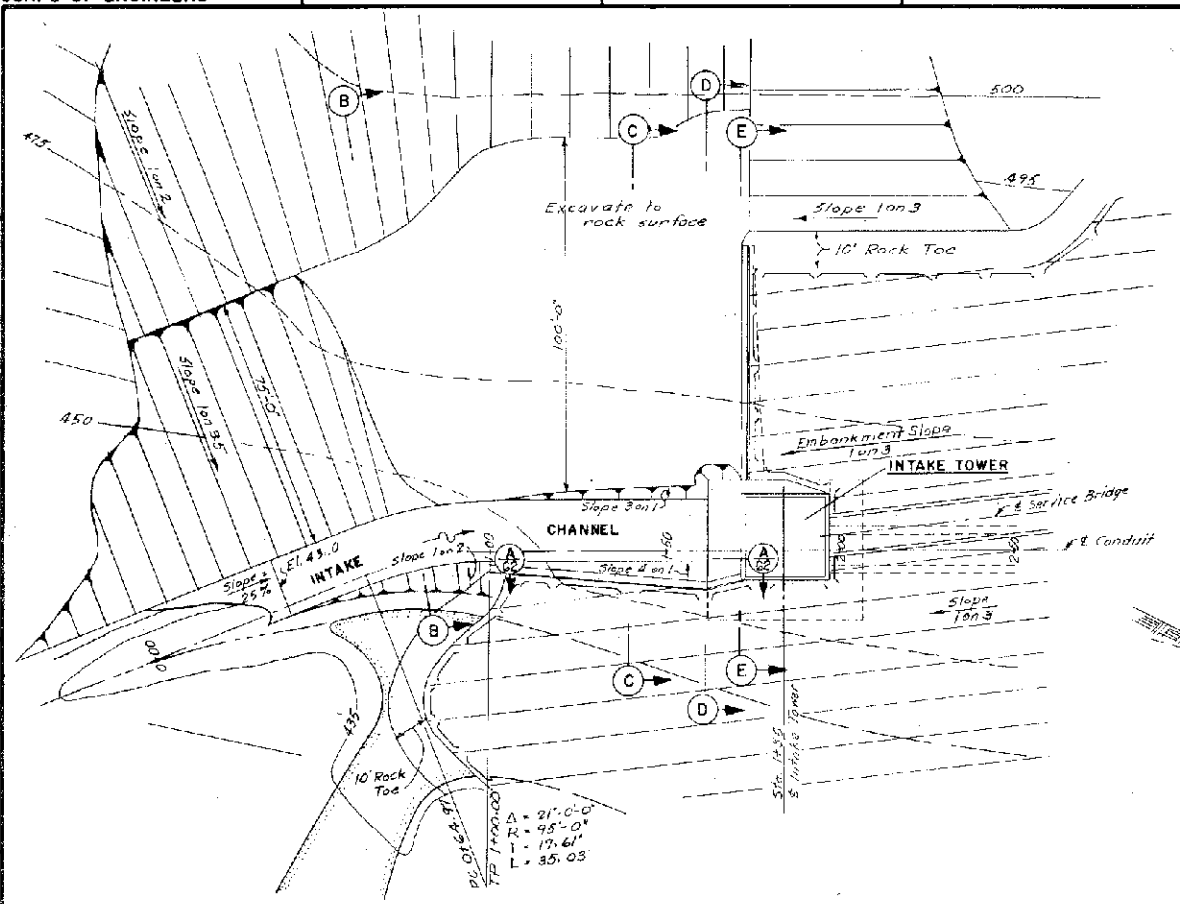
SCALE: 1" = 40' | SPEC. NO. CIV. ENG. 18-016-62-45

DRAWING NUMBER
CT-1-5766

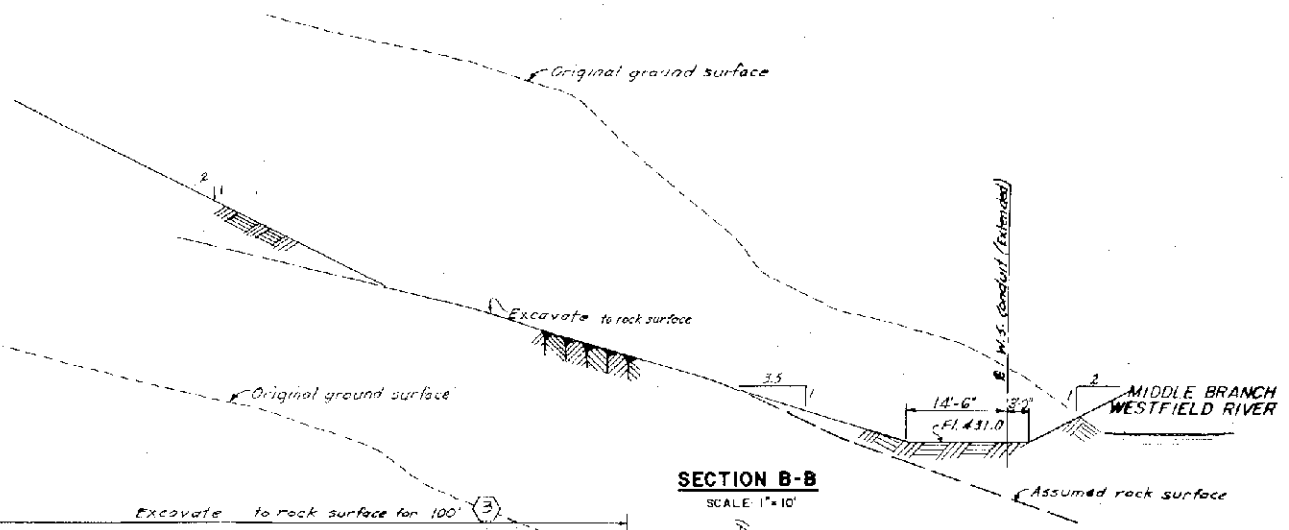
SHEET 60

MORNAN PLAN PRINT CO., BOSTON, MASS.

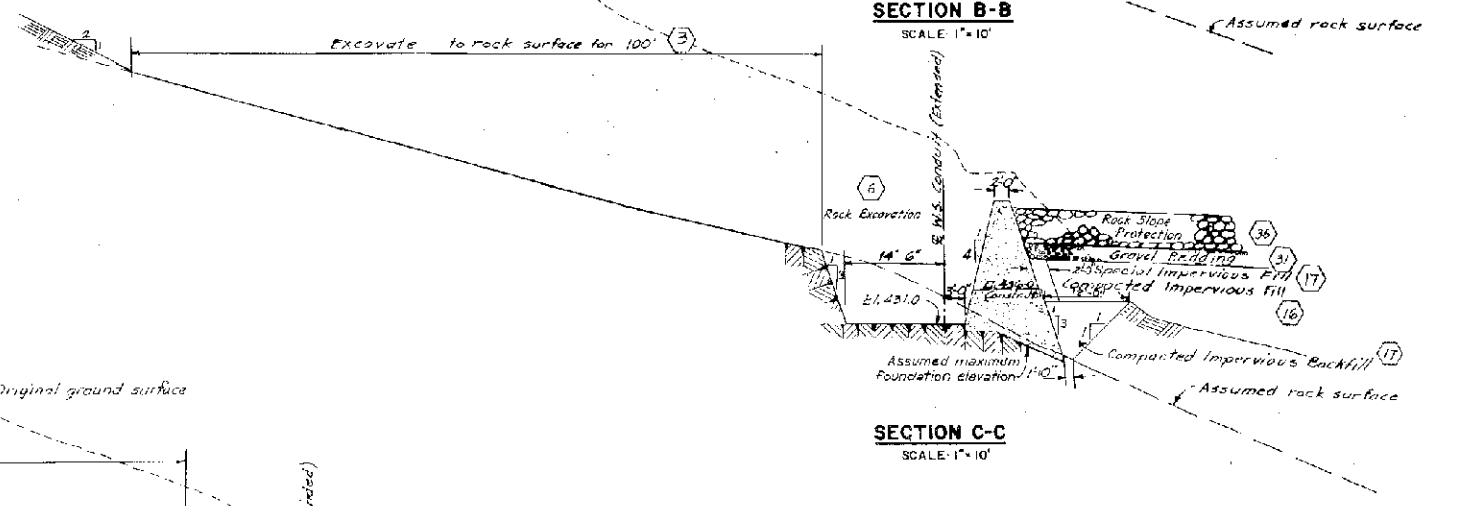
CORPS OF ENGINEERS — U. S. ARMY



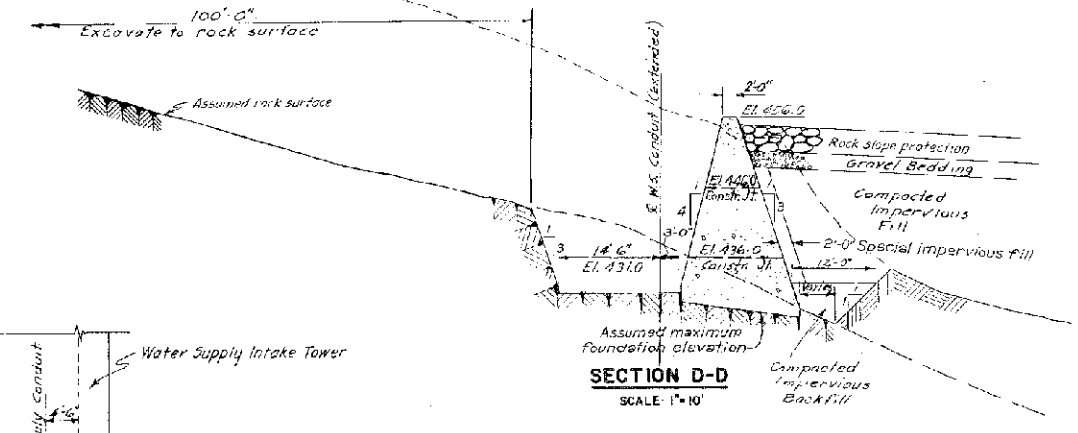
PLAN
SCALE: 1"=20'



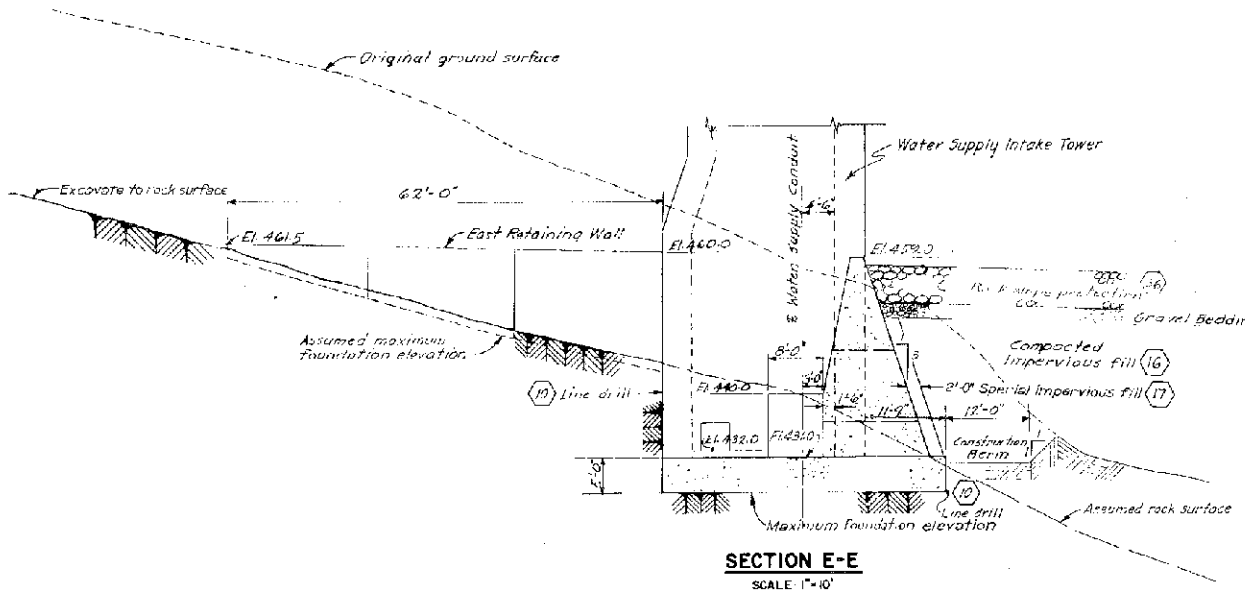
SECTION B-B
SCALE: 1"=10'



SECTION C-C
SCALE: 1"=10'



SECTION D-D
SCALE: 1"=10'



SECTION E-E
SCALE: 1"=10'

NOTES

All elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate item numbers under which payment will be made.
For general notes see Sheet No. 60.
Concrete retaining walls will be paid for under Item No. 55.
For details of structural joints see Sheet No. 34.
All joints shown on this sheet to be flush

GRAPHIC SCALES
1"=20' 20' 0 20' 40'
1"=10' 10' 0 10' 20'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY K.S.B. | DR. BY K.H.W. | CK. BY P.H.

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, ENGR. BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

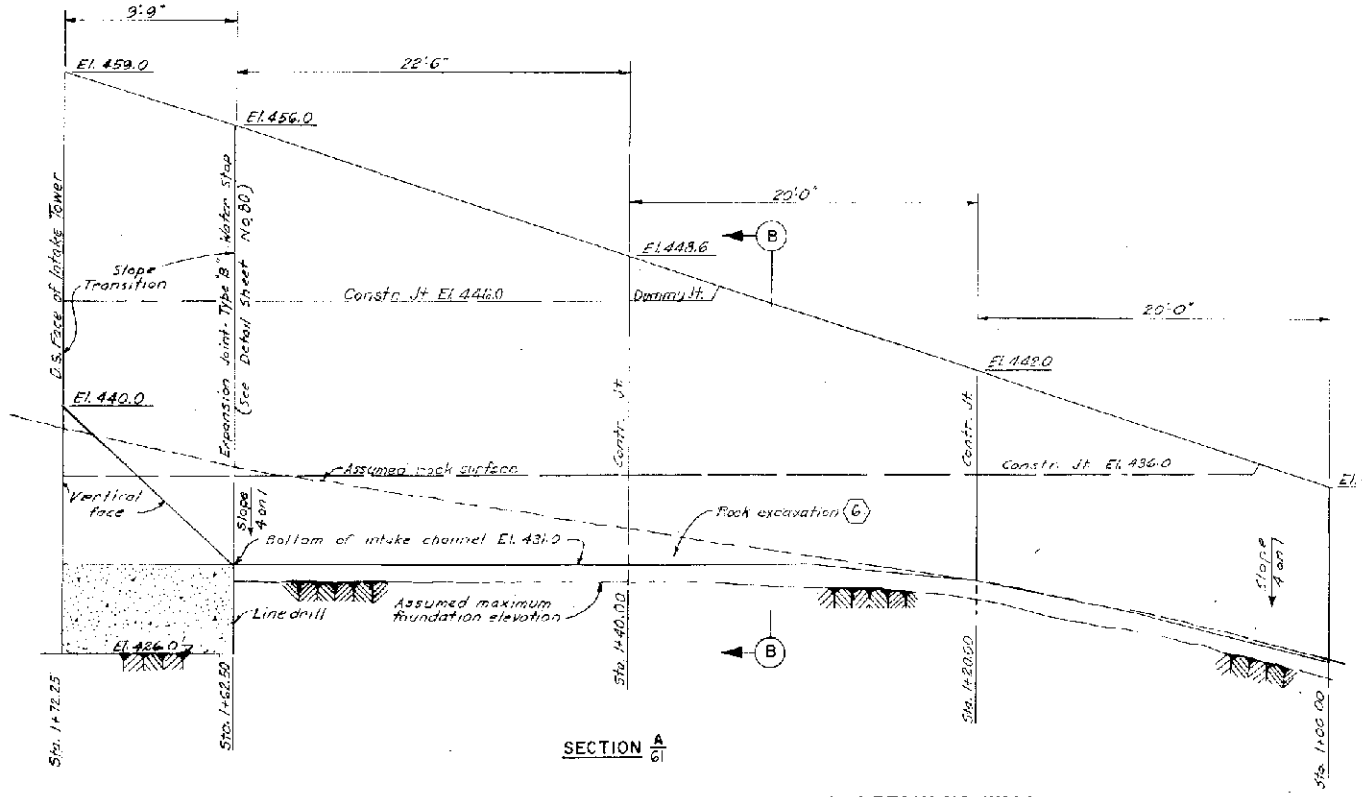
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

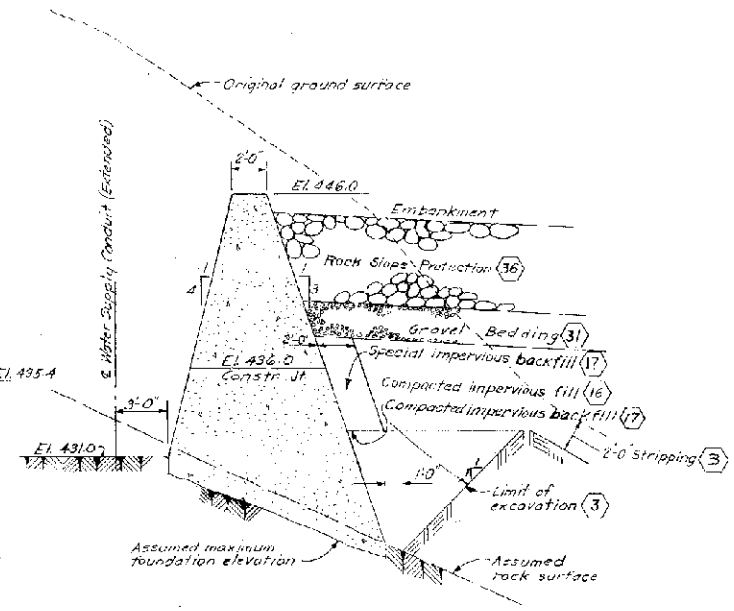
DRAWING NUMBER
CT-1-5767

SHEET 61

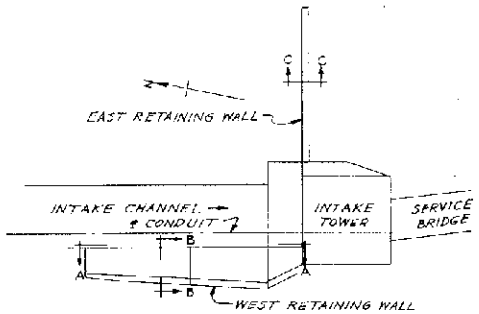
CORPS OF ENGINEERS — U. S. ARMY



SECTION A/61



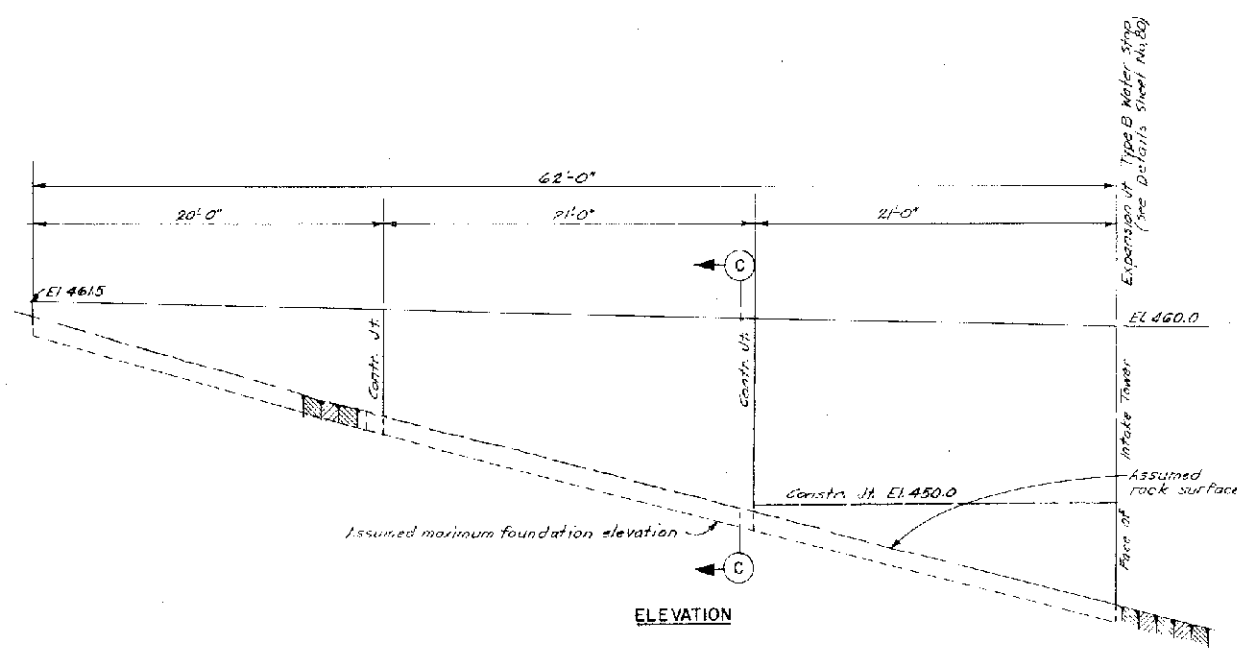
SECTION B-B



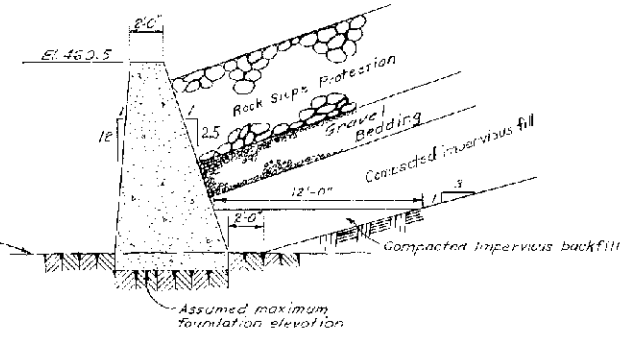
KEY PLAN

WEST RETAINING WALL

SCALE: 1/4" = 1'-0"



ELEVATION



SECTION C-C

EAST RETAINING WALL

SCALE: 1/4" = 1'-0"

NOTES:

Elevations refer to Mean Sea Level Datum.
For details of structural jts. see Sheet No. 34.
Concrete in Retaining Walls will be paid for under Item No. 55.
All joints shown on this sheet to be flush.
Figures in hexagons indicate item numbers under which payment will be made.

GRAPHIC SCALE

1/4" = 1'-0" — 0 — 4' — 8'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	K.H.W.	

PROJECT ENGINEER

RECOMMENDED: CHIEF, ENGR. DIVISION

APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
RETAINING WALLS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

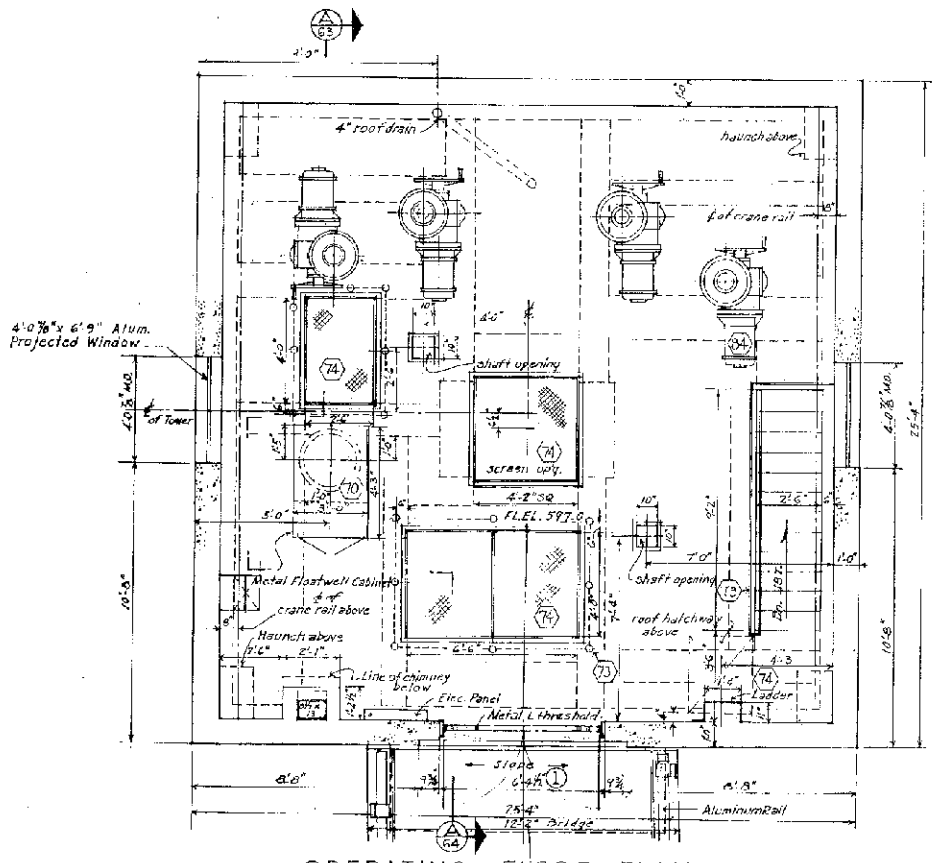
DATE MARCH 1962

SCALE: 1/4"=1'-0" SPEC. NO. CIV. ENG. 19-016-62-45

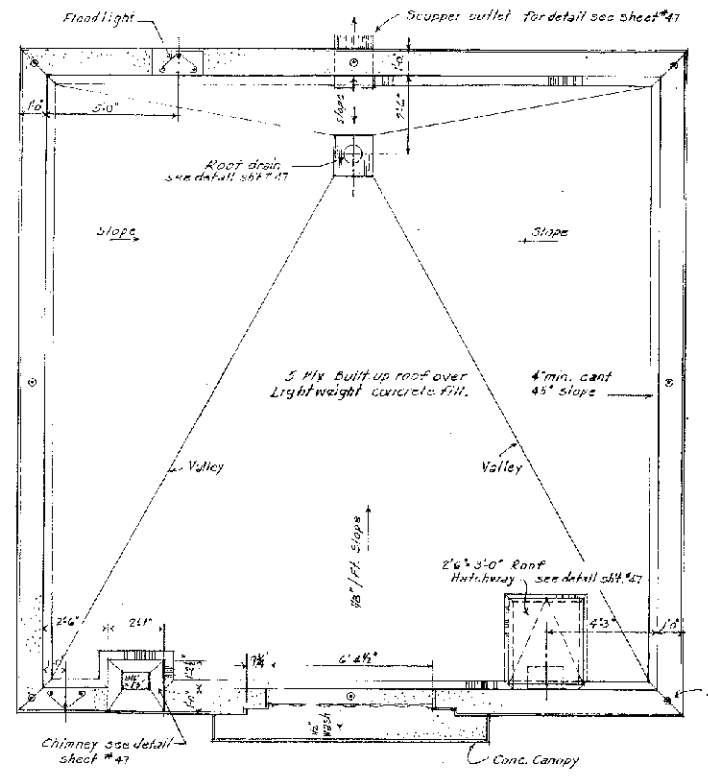
DRAWING NUMBER
CT-1-5768

SHEET 62

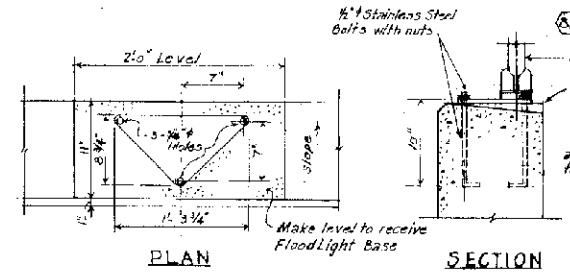
CORPS OF ENGINEERS — U.S. ARMY



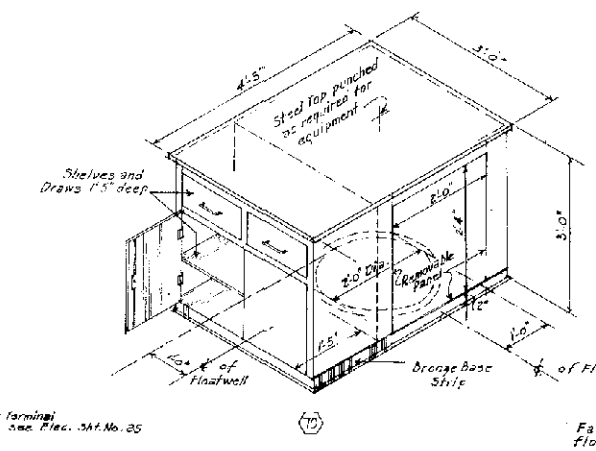
OPERATING FLOOR PLAN
SCALE 3/8"=1'-0"



ROOF PLAN
SCALE 3/16" = 1'-0"

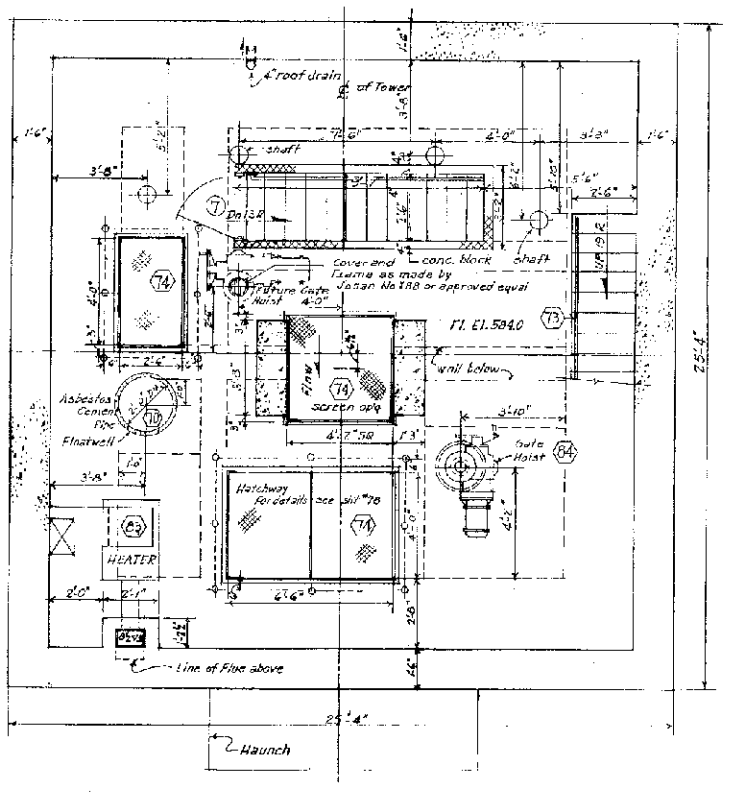


FLOOD LIGHT ANCHORAGE
SCALE 1½" = 1'-0"



Fasten cabinet to concrete floor by concealed L anchors

METAL CABINET OVER FLOAT WELL
SCALE 3/4" = 1'-0"



HEATER FLOOR PLAN
SCALE 3/8" = 1'-0"

GRAPHIC SCALES
3/8"=1'-0" 0 1' 2' 3' 4' 5' 10'
1½"=1'-0" 12" 9" 6" 3" 0 6" 12" 16"

NOTE:
All items on this sheet will be paid under Item No. 69 unless otherwise indicated.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.C.G.	J.C.G.	

SUBMITTED: Chief, Engrg. Div.
PROJECT ENGINEER
RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Engineering Division
RECOMMENDED: Chief, C. W. R. Branch

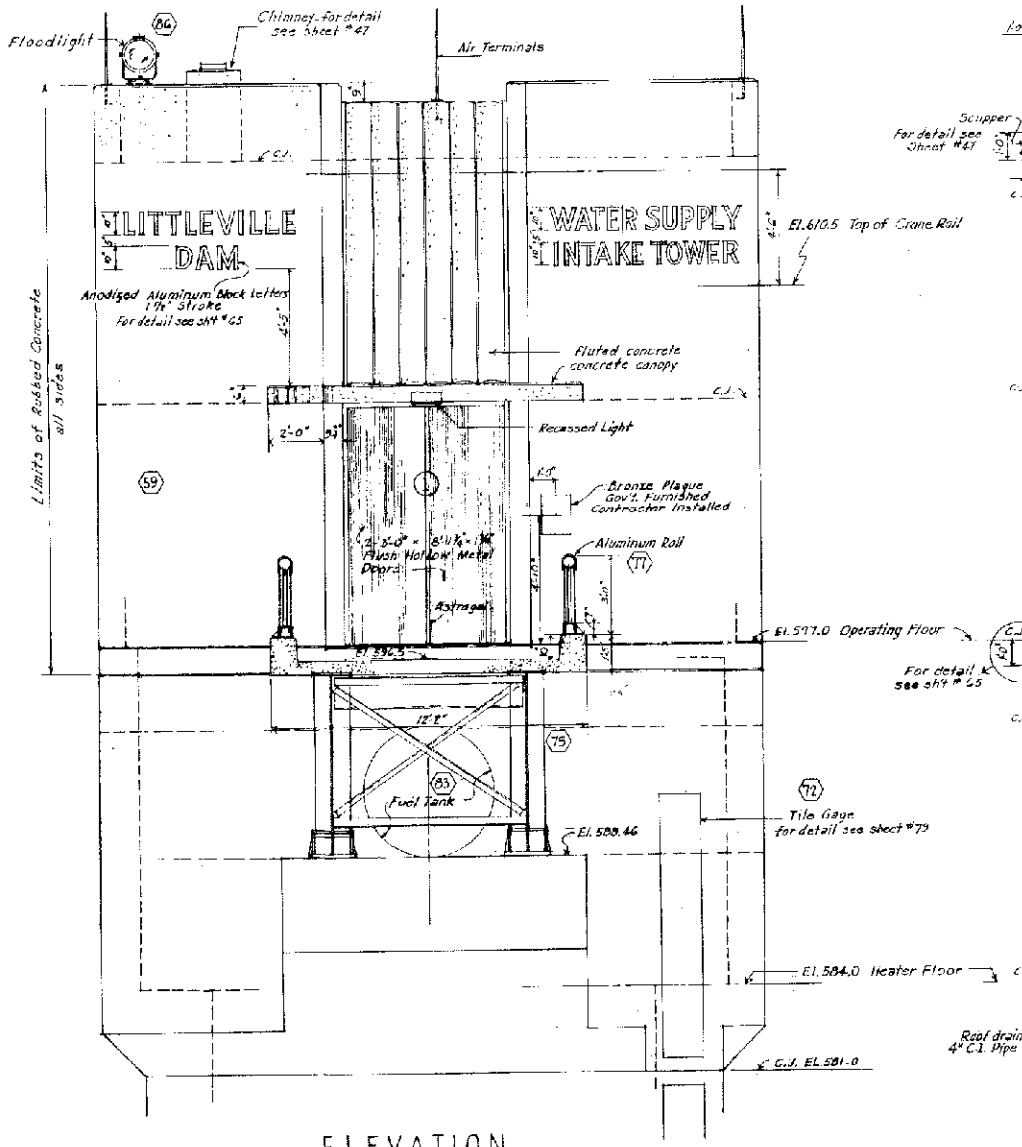
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY – INTAKE TOWER
ARCHITECTURAL
PLANS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED: Chief, Engineering Division
DATE: MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 9-016-62-19
DRAWING NUMBER
CT-1-5769
SHEET 63

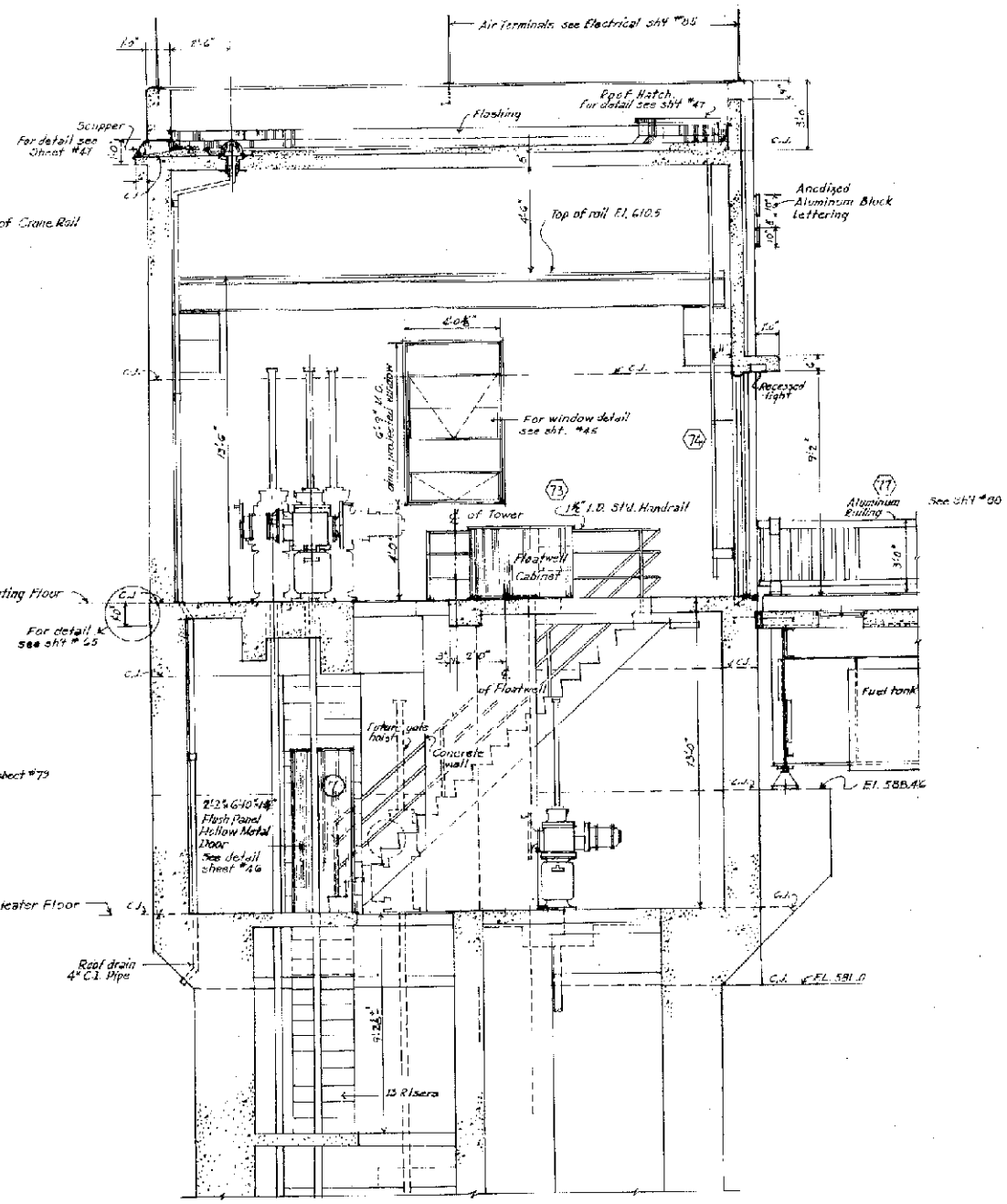
CORPS OF ENGINEERS

U. S. ARMY



ELEVATION

SCALE 3/8" = 1'-0"



SECTION

SCALE 3/8" = 1'-0"

GRAPHIC SCALE

3/8"=1'-0" 0 1' 2' 3' 4' 5' 10'

NOTE:

For door schedule see sheet #46

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.C.G.	J.C.G.	

SUBMITTED: Chief, Arch. Section

PROJECT ENGINEER

APPROVAL RECOMMENDED: Chief, Design Branch

APPROVAL RECOMMENDED: Chief, E & D Division

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY - INTAKE TOWER
ARCHITECTURAL
ELEVATION AND SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED: Chief, Engineering Division

DATE: MARCH 1962

SCALE AS SHOWN

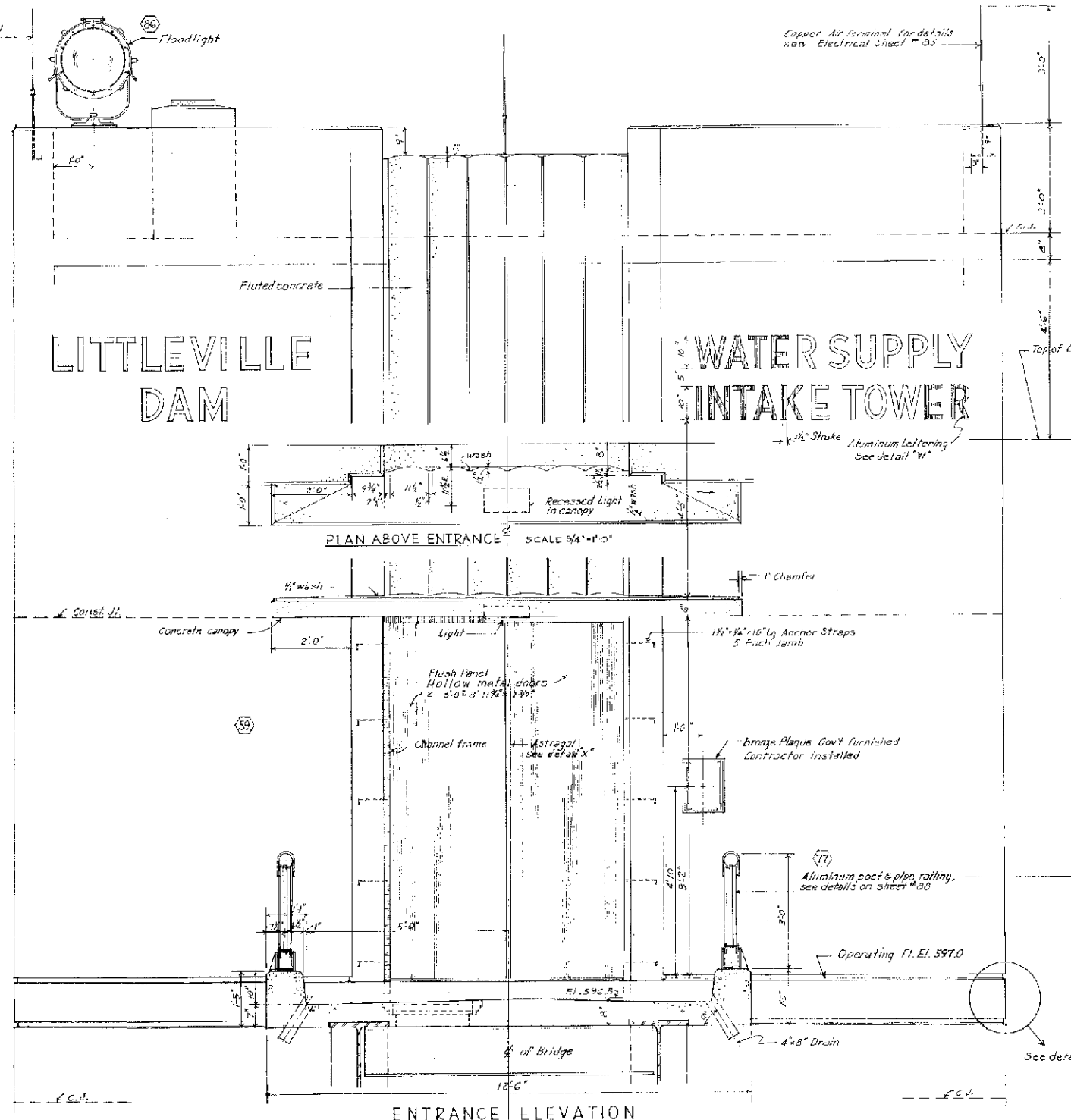
SPEC. NO. CIV. ENG. 19-065-62-49

DRAWING NUMBER
CT-I-5770

SHEET 64

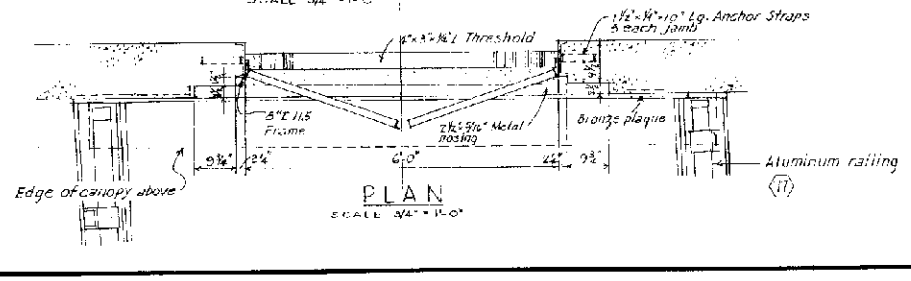
CORPS OF ENGINEERS — U. S. ARMY

LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER

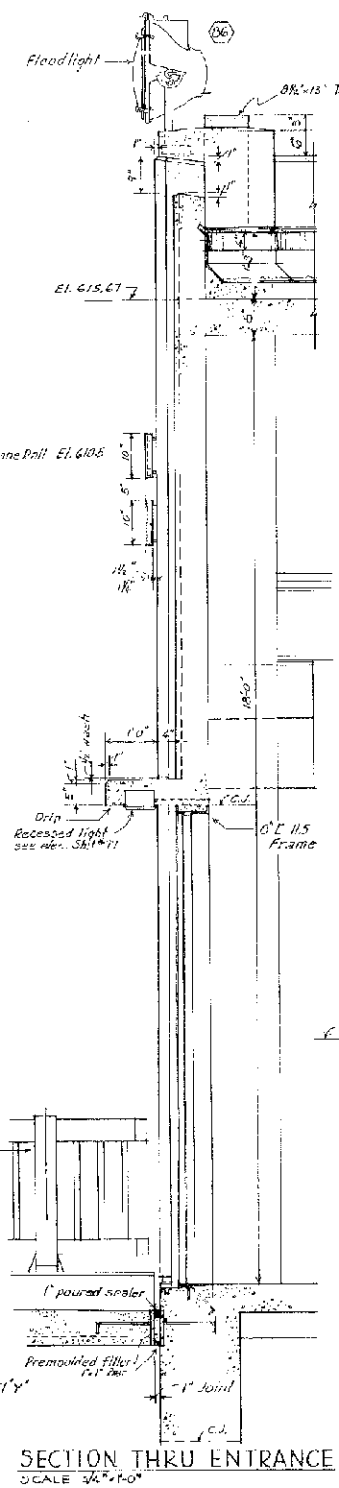


PLAN ABOVE ENTRANCE SCALE 3/4"=1'-0"

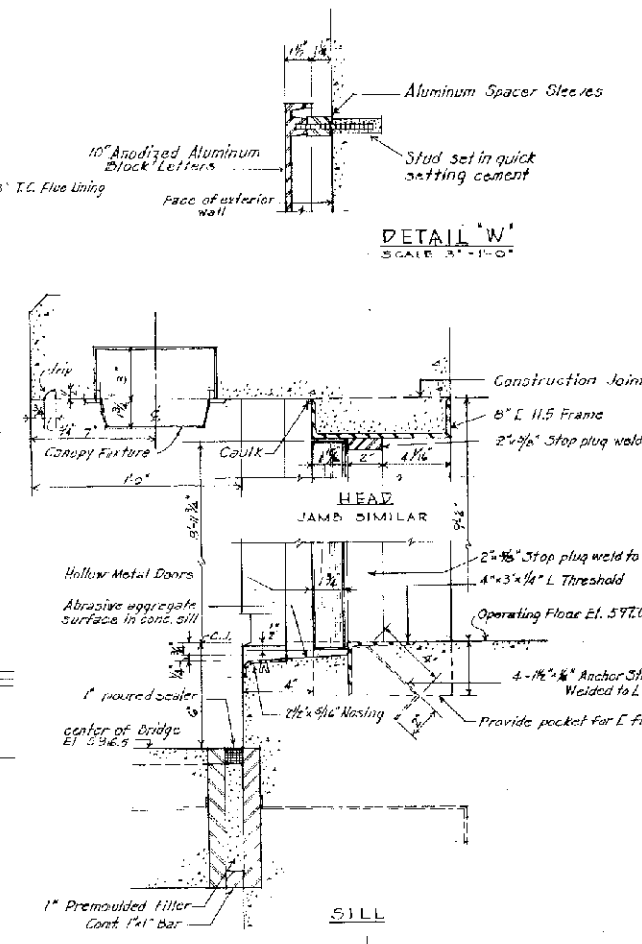
ENTRANCE ELEVATION SCALE 3/4"=1'-0"



PLAN SCALE 3/4"=1'-0"

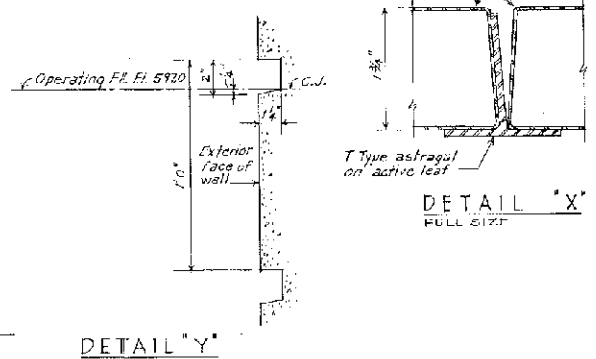


SECTION THRU ENTRANCE SCALE 3/4"=1'-0"



DETAIL "W" SCALE 3"=1'-0"

EXTERIOR DOOR DETAIL SCALE 3"=1'-0"



DETAIL "X" FULL SIZE

DETAIL "Y" SCALE 3"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.C.K.	DR. BY J.C.O.	CK. BY
SUBMITTED		
CHIEF BRANCH / SECTION		
PROJECT ENGINEER		
APPROVED / RECOMMENDED		
CHIEF OF BRANCH		
APPROVED / RECOMMENDED		
CHIEF ENGINEERING DIVISION		

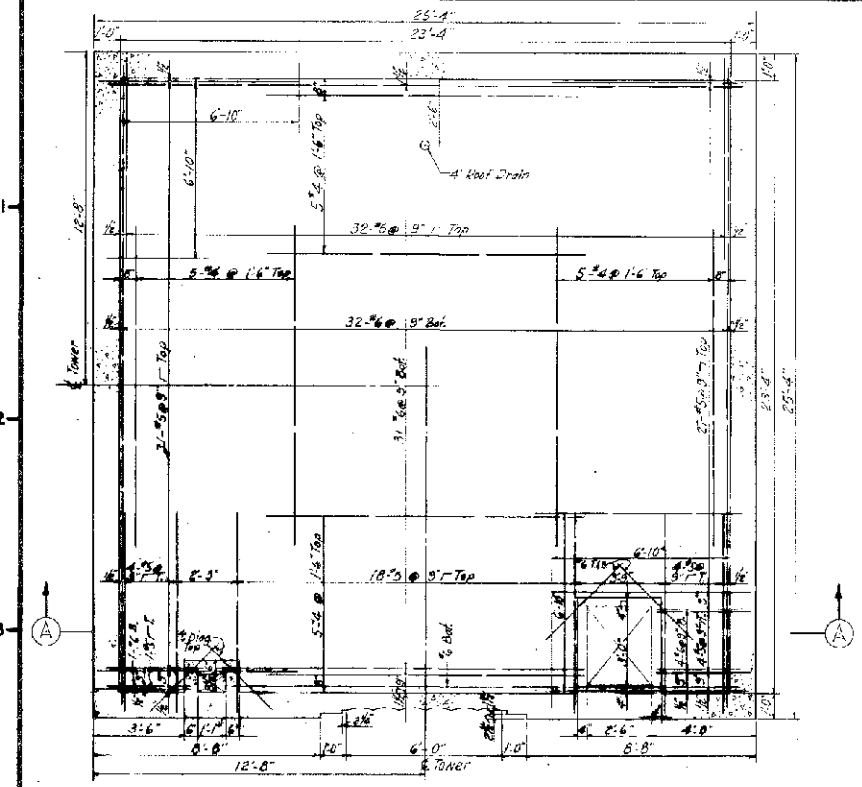
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
ARCHITECTURAL
ENTRANCE DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED _____ DATE MARCH 1972
CHIEF ENGINEERING DIVISION

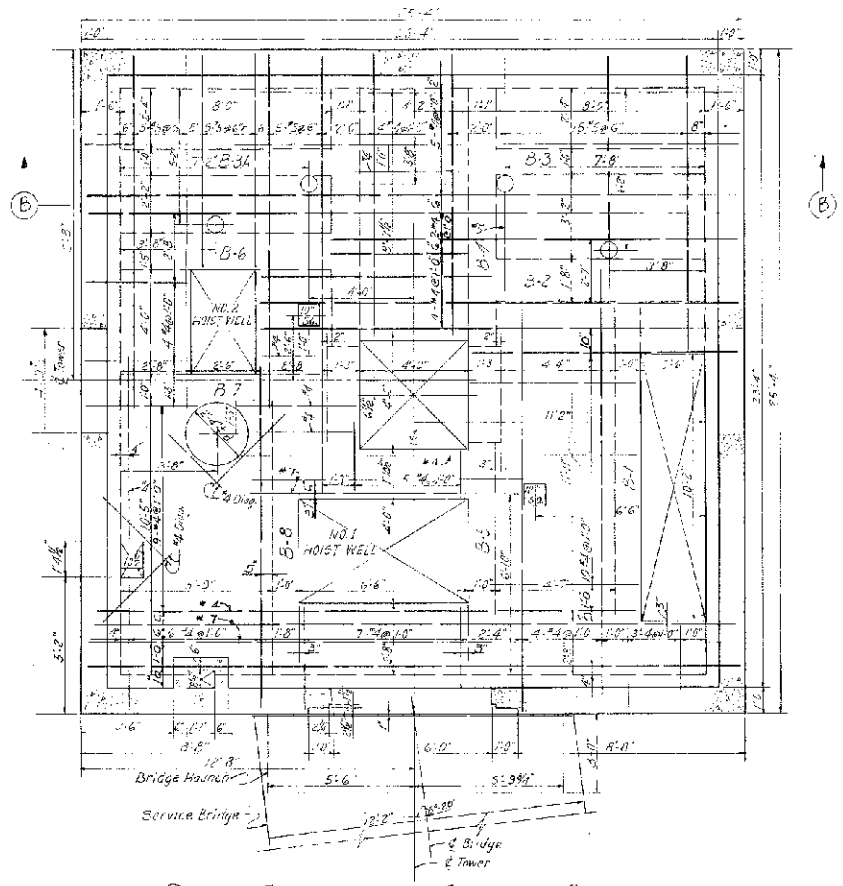
GRAPHIC SCALE
3/4"=1'-0" 1' 0 1' 2' 3'
3"=1'-0" 3" 0 3" 6" 9"

SCALE AS SHOWN | SPEC. NO. DIV. L. NO. 1970-S-5-49
DRAWING NUMBER CT-1-5771
SHEET 65

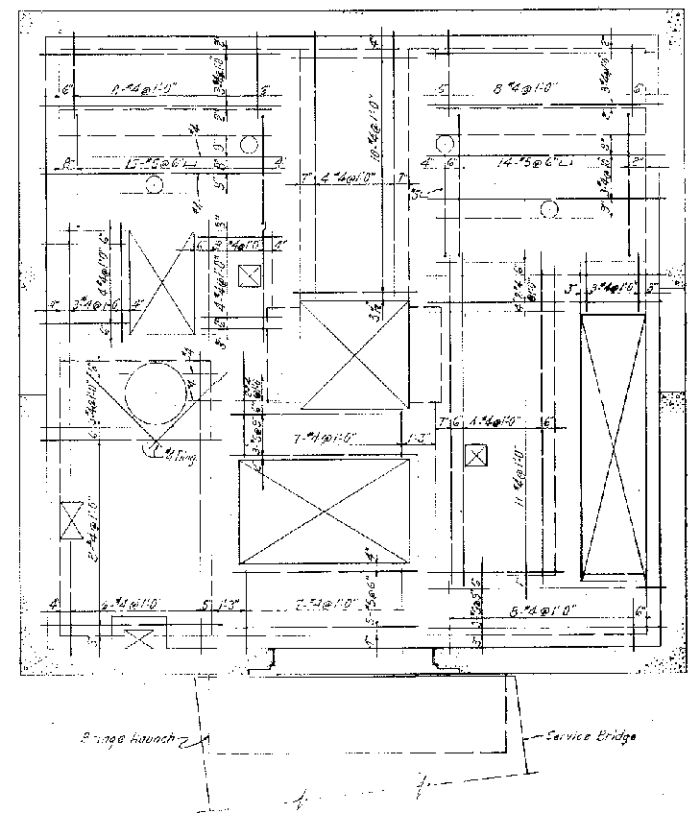
CORPS OF ENGINEERS — U. S. ARMY



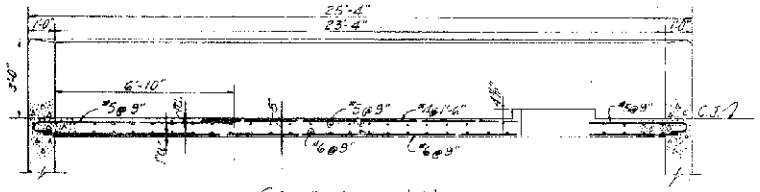
PLAN - ROOF SLAB
SCALE: 3/8" = 1'-0"



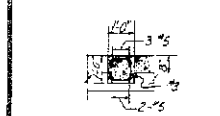
PLAN - OPERATING FLOOR SLAB
TOP STEEL
SCALE: 3/8" = 1'-0"



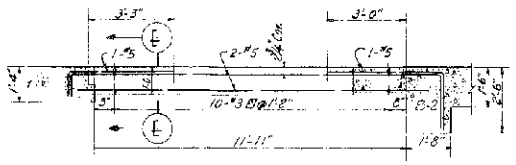
PLAN - OPERATING FLOOR SLAB
BOTTOM STEEL
SCALE: 3/8" = 1'-0"



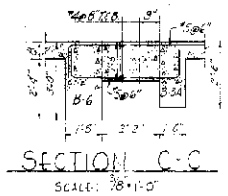
SECTION A-A
SCALE: 3/8" = 1'-0"



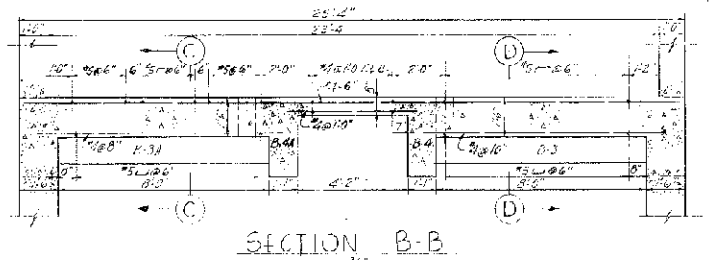
SECTION E-E
SCALE: 3/8" = 1'-0"



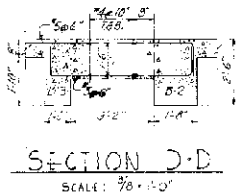
BEAM B-1
SCALE: 3/8" = 1'-0"



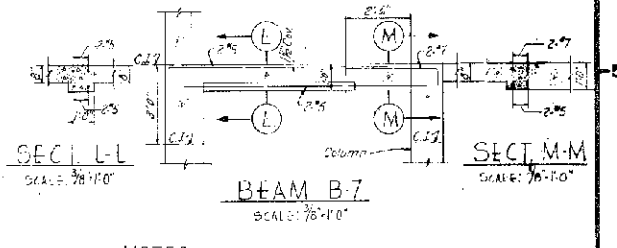
SECTION C-C
SCALE: 3/8" = 1'-0"



SECTION B-B
SCALE: 3/8" = 1'-0"



SECTION D-D
SCALE: 3/8" = 1'-0"



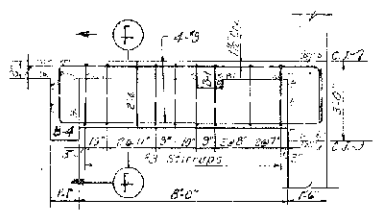
SECT L-L
SCALE: 3/8" = 1'-0"

BEAM B-7
SCALE: 3/8" = 1'-0"

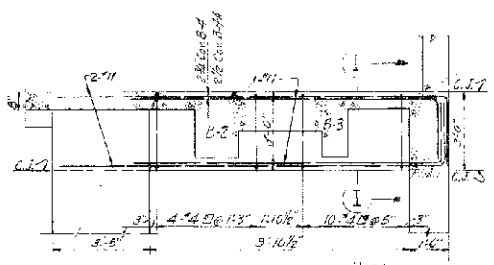
SECT M-M
SCALE: 3/8" = 1'-0"



SECTION f-f
SCALE: 3/8" = 1'-0"

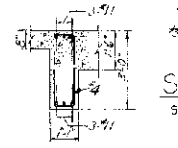


BEAM B-2
SCALE: 3/8" = 1'-0"

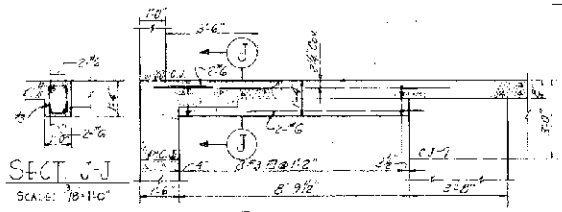


BEAM B-4
SCALE: 3/8" = 1'-0"

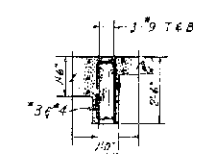
NOTE-
Reinf. in beam B-4A is similar.



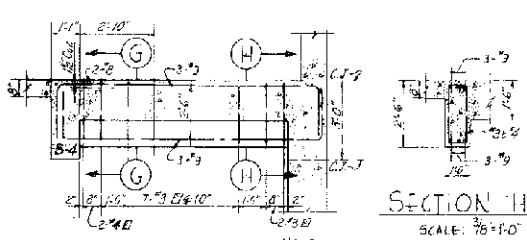
SECTION I-I
SCALE: 3/8" = 1'-0"



BEAM B-5
SCALE: 3/8" = 1'-0"



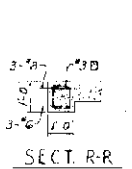
SECTION G-G
SCALE: 3/8" = 1'-0"



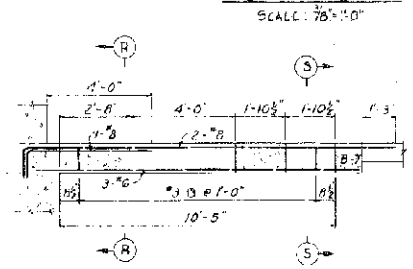
BEAM B-3
SCALE: 3/8" = 1'-0"

NOTE
Reinf. in Beam B-3A is similar.

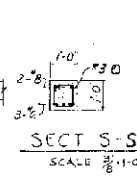
SECTION H-H
SCALE: 3/8" = 1'-0"



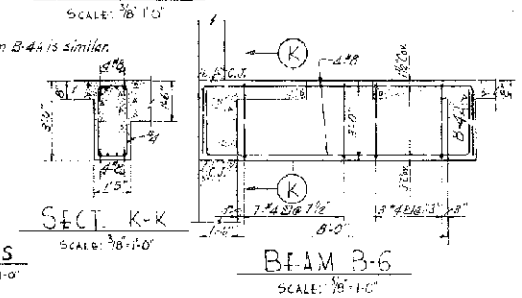
SECT R-R
SCALE: 3/8" = 1'-0"



BEAM B-8
SCALE: 1/2" = 1'-0"



SECT S-S
SCALE: 3/8" = 1'-0"



SECT K-K
SCALE: 3/8" = 1'-0"

BEAM B-6
SCALE: 3/8" = 1'-0"

NOTES

For general notes applying to this sheet, except concrete payment item numbers, see Sheet No. 49.

Payment for concrete shown on this sheet will be made under Item No. 59.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.A.K. | DR. BY M.I. | CK. BY D.M.

SUBMITTED: [signature] CHIEF, ENGINEERING DIVISION

RECOMMENDED: [signature] CHIEF, DESIGN BRANCH

APPROVED: [signature] CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
ROOF & OPERATING FL. SLABS-REINF DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

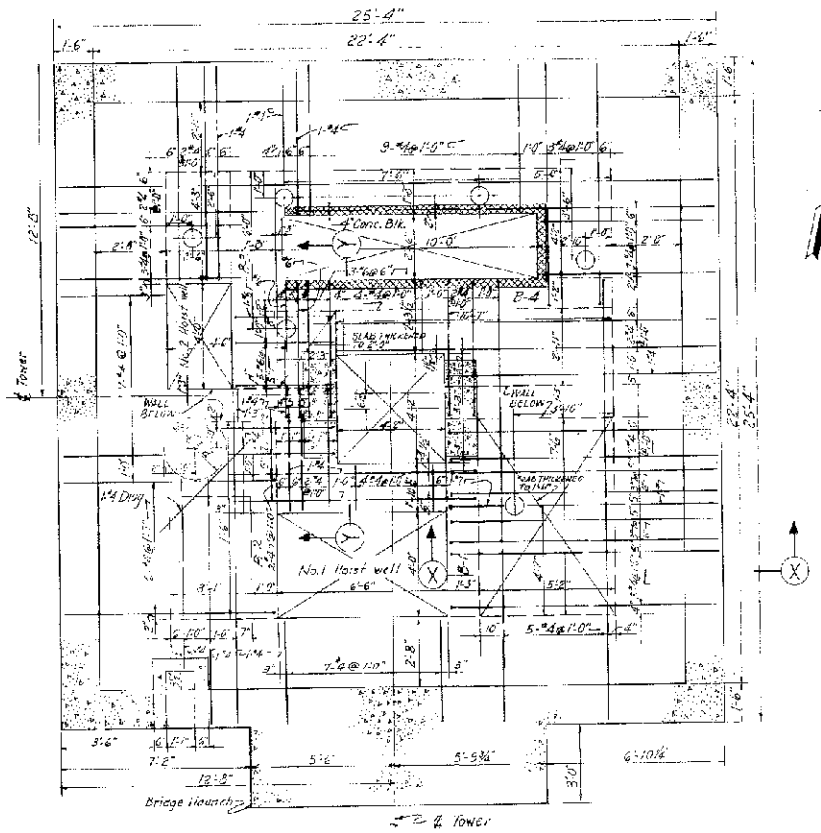
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG-19-60-2245

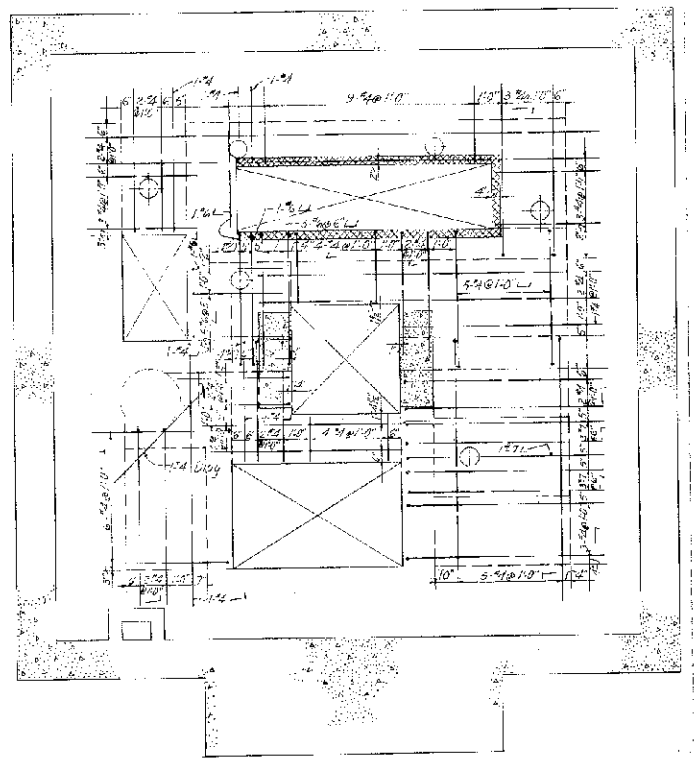
DRAWING NUMBER
CT-1-5772

SHEET 66

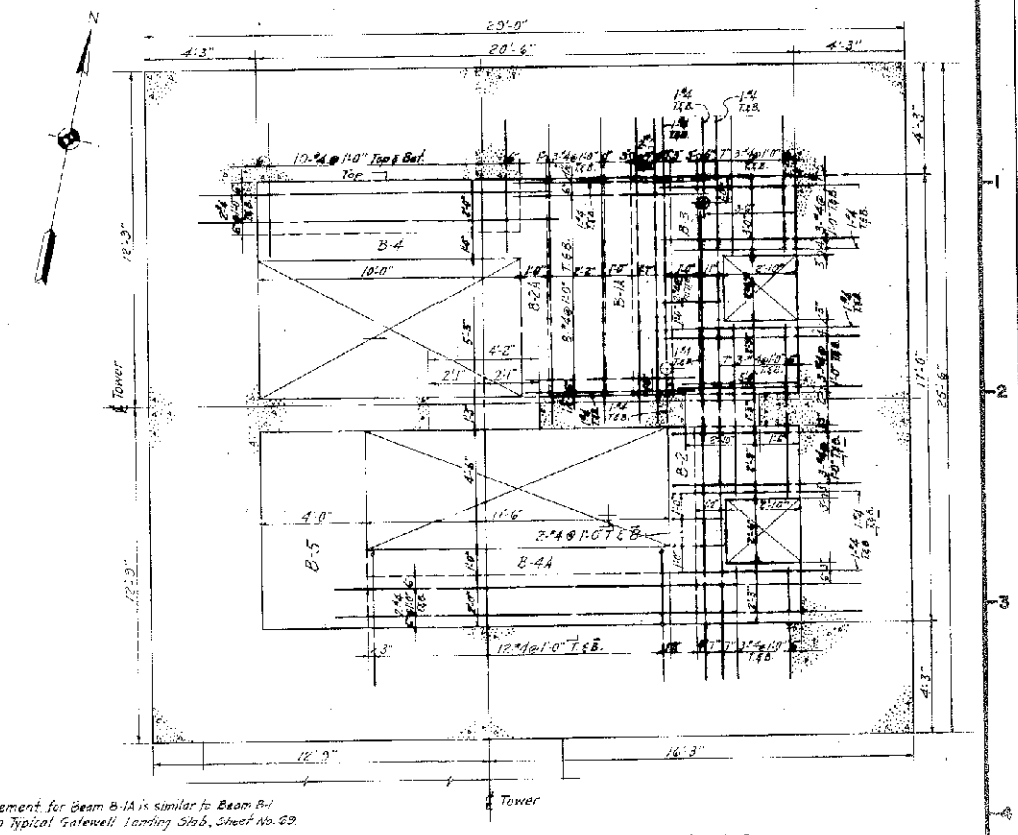
CORPS OF ENGINEERS — U. S. ARMY



PLAN - HEATER RM FL SLAB - EL 581.0
SHOWING TOP STEEL REINFORCEMENT
SCALE: 3/8"=1'-0"

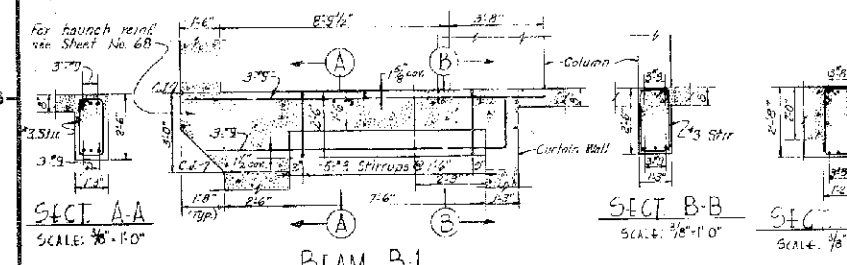


PLAN - HEATER RM FL SLAB
SHOWING BOTTOM STEEL REINFORCEMENT
SCALE: 3/8"=1'-0"



NOTE:
Reinforcement for Beam B-1A is similar to Beam B-1 as shown in Typical Gatewell Landing Slab, Sheet No. 69

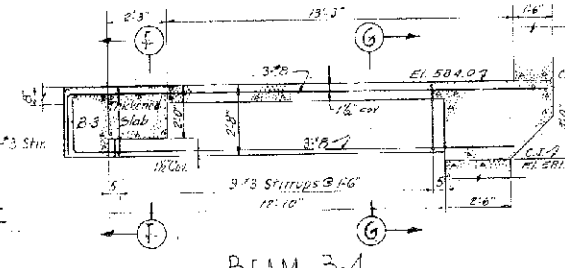
PLAN - GATEWELL FL. SLAB - EL 446.0
SCALE: 3/8"=1'-0"



SECT. A-A
SCALE: 3/8"=1'-0"

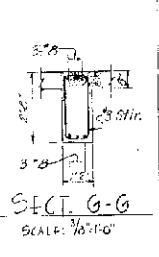
SECT. B-B
SCALE: 3/8"=1'-0"

SECT. E-E
SCALE: 3/8"=1'-0"

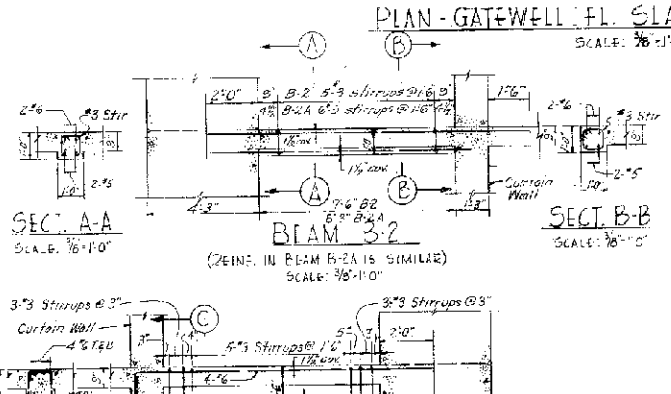


BEAM B-1
SCALE: 3/8"=1'-0"

BEAM B-4
SCALE: 3/8"=1'-0"



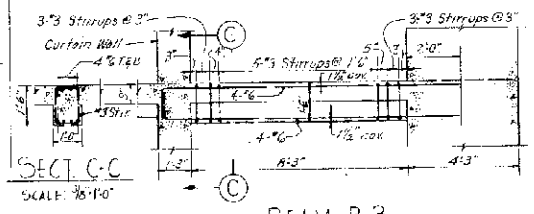
SECT. G-G
SCALE: 3/8"=1'-0"



SECT. A-A
SCALE: 3/8"=1'-0"

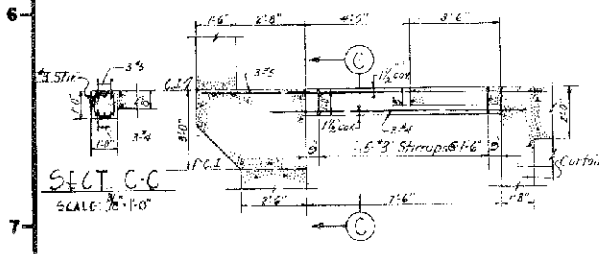
BEAM B-2
(REINF. IN BEAM B-2A IS SIMILAR)
SCALE: 3/8"=1'-0"

SECT. B-B
SCALE: 3/8"=1'-0"



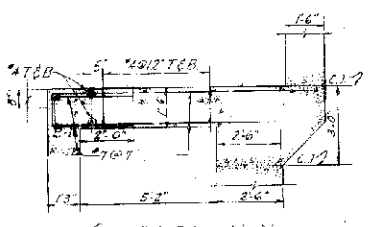
SECT. C-C
SCALE: 3/8"=1'-0"

BEAM B-3
SCALE: 3/8"=1'-0"

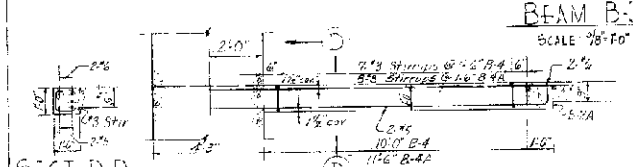


SECT. C-C
SCALE: 3/8"=1'-0"

BEAM B-2
SCALE: 3/8"=1'-0"

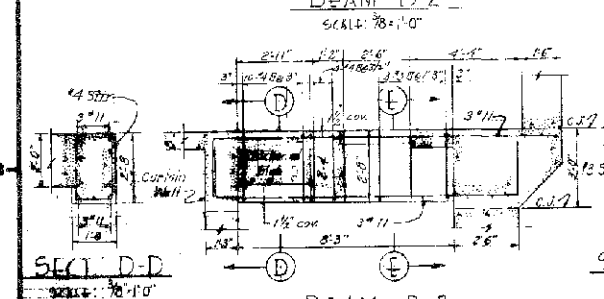


SECTION X-X
SCALE: 3/8"=1'-0"



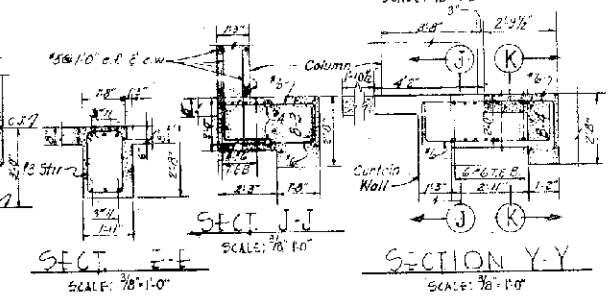
SECT. D-D
SCALE: 3/8"=1'-0"

BEAM B-4
(REINF. IN BEAM B-4A IS SIMILAR)
SCALE: 3/8"=1'-0"



SECT. D-D
SCALE: 3/8"=1'-0"

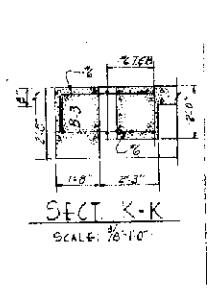
BEAM B-3
SCALE: 3/8"=1'-0"



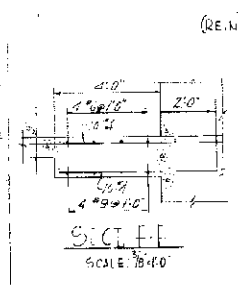
SECT. E-E
SCALE: 3/8"=1'-0"

SECT. J-J
SCALE: 3/8"=1'-0"

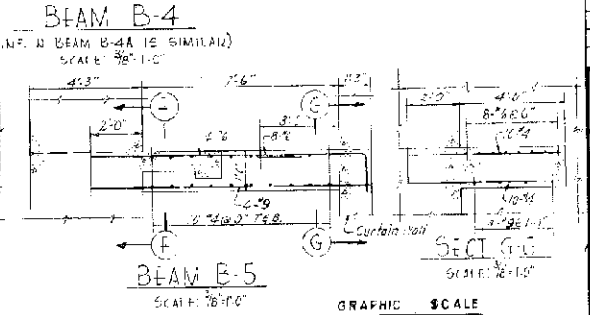
SECTION Y-Y
SCALE: 3/8"=1'-0"



SECT. K-K
SCALE: 3/8"=1'-0"



SECT. F-F
SCALE: 3/8"=1'-0"



BEAM B-5
SCALE: 3/8"=1'-0"

SECT. G-G
SCALE: 3/8"=1'-0"

GRAPHIC SCALE
3/8"=1'-0"

NOTES:

For general notes applying to this sheet, except for concrete payment items, see Sheet No. 49.
Payment for concrete shown on this sheet will be made under the following item numbers:
Below El. 482.0 — Item No. 57
Above El. 581.0 — Item No. 59

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

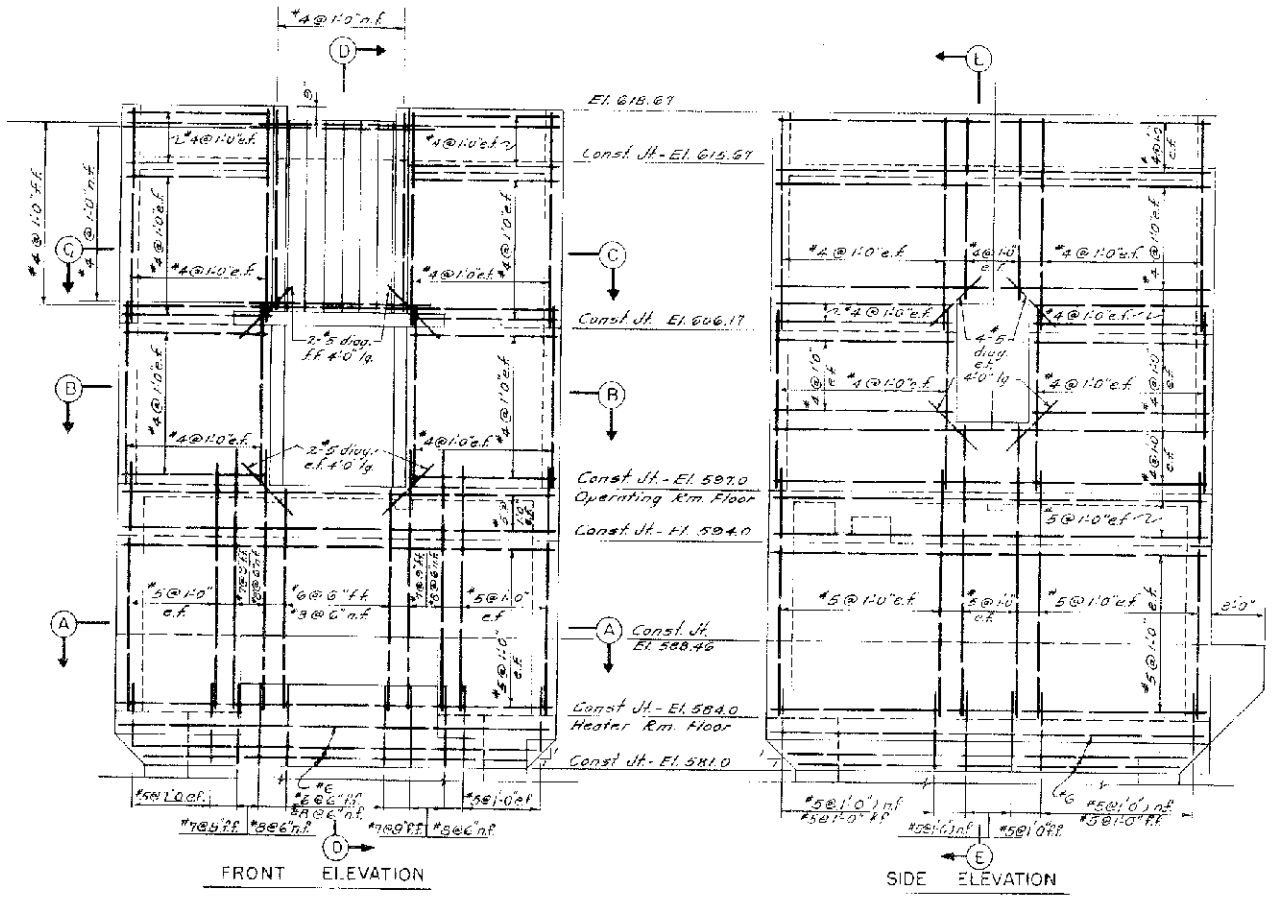
DES. BY M.A.K. | DR. BY P.L.L. | CK. BY

SUBMITTED: Chief, Engineering Section
BRANCH ENGINEER
RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Engineering Division

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
HEATER RM & GATE WELL FL. SLABS-REIN. DET.
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVED: [illegible] DATE: MARCH 1962

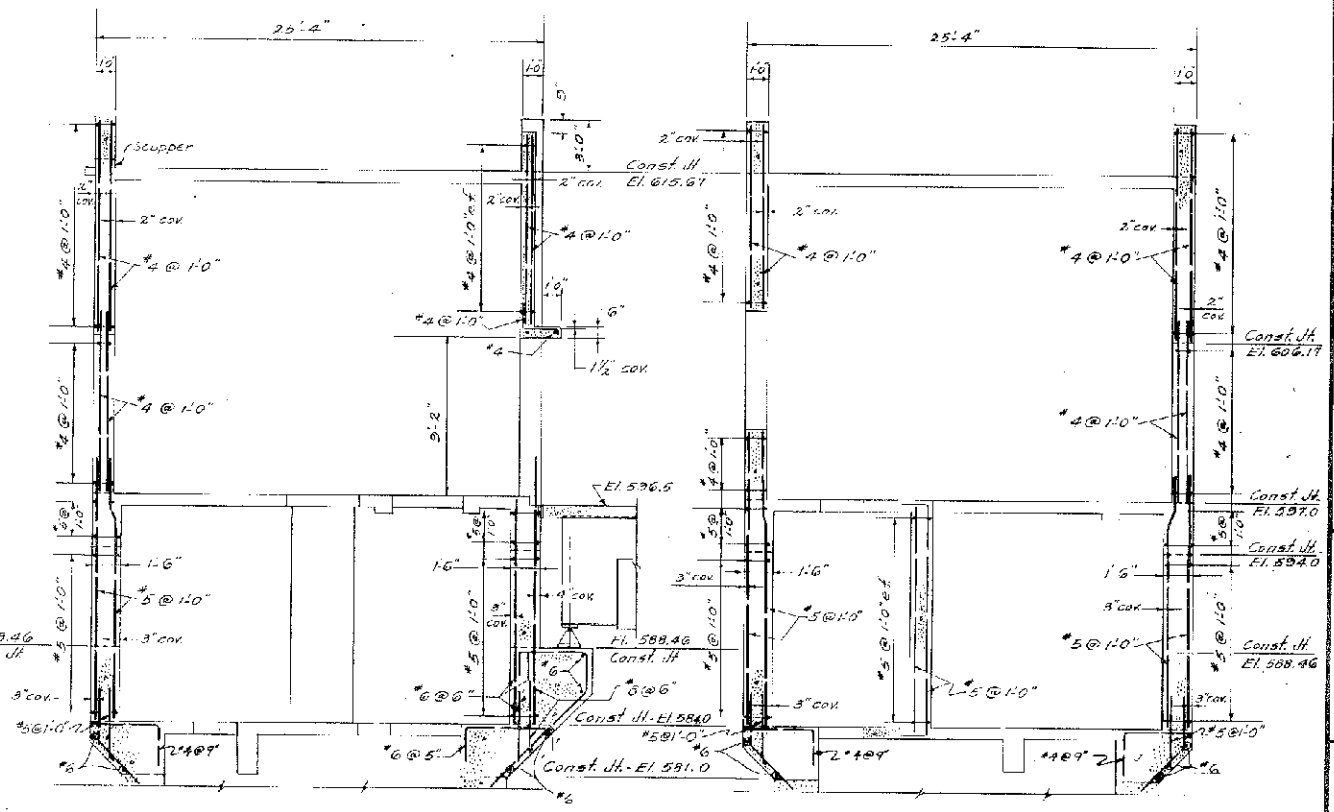
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-018-62-49
DRAWING NUMBER
CT-1-5773
SHEET 67

CORPS OF ENGINEERS — U. S. ARMY



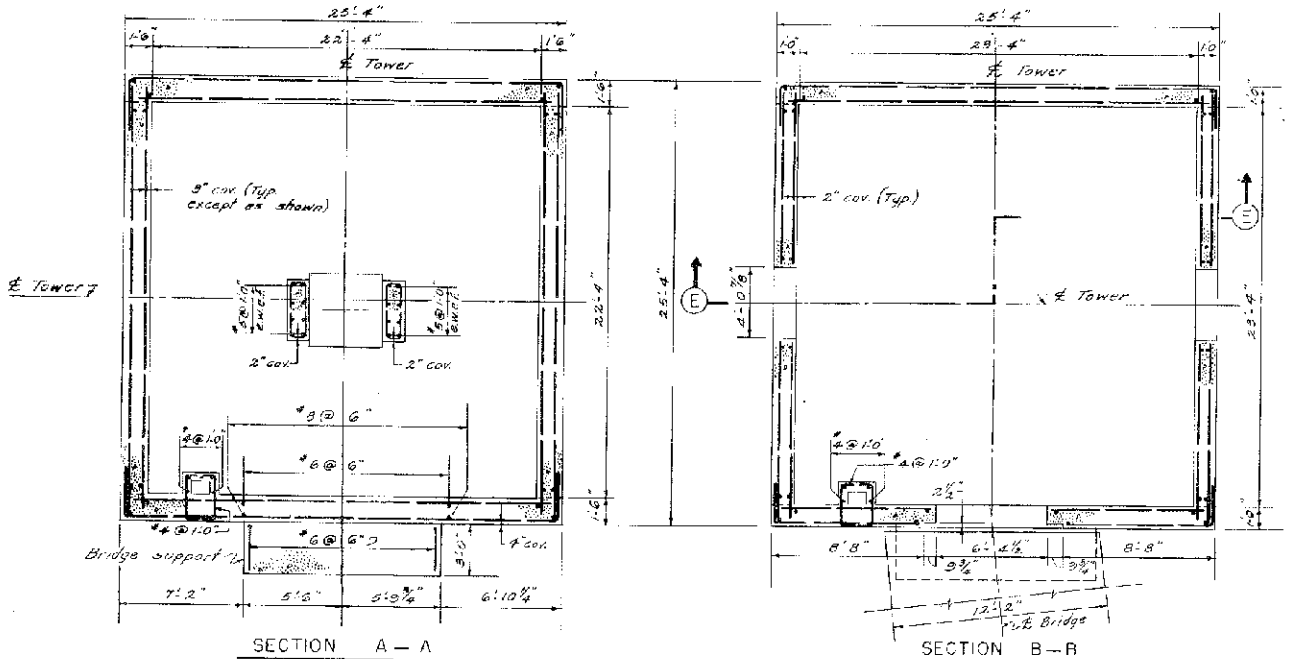
FRONT ELEVATION

SIDE ELEVATION



SECTION D — D

SECTION E — E

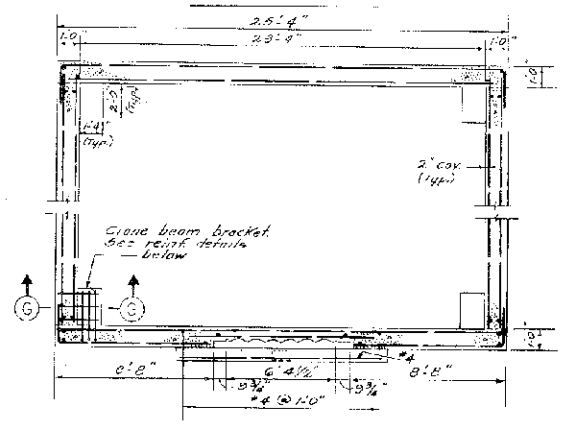


SECTION A — A

All reinf. #5 @ 1'-0" e.w.e.f. except as noted

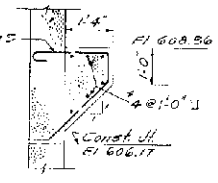
SECTION B — B

All reinf. #4 @ 1'-0" e.w.e.f.



SECTION C — C

All reinf. #4 @ 1'0" e.w.e.f.



SECTION G — G

CRANE BEAM BRACKET DETAILS

SCALE 12" = 1'-0"

GRAPHIC SCALES

1/4" = 1'-0"

1/2" = 1'-0"

NOTES:

For general notes applying to this sheet, except concrete payment items, see Sheet No. 49.

Payment for concrete shown on this sheet will be made under the following item numbers —

El. 582.0 — El. 581.0 Item No. 58

Above El. 581.0 Item No. 59

All horizontal construction joints shown on this sheet shall be flush joints except joint at El. 597.0. For details of this joint see architectural details.

For architectural details see sheet Nos. 63, 64 and 65.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.K. | DR. BY C.M.A. | CK. BY J.P.M.

SUBMITTED: Chief, Eng. Design Section

PROJECT ENGINEER

APPROVAL RECOMMENDED: Chief, Design Branch

APPROVED: Chief, Engineering Division — DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL — SUPERSTRUCTURE
ELEVATIONS & SECTIONS-REINFORCING DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

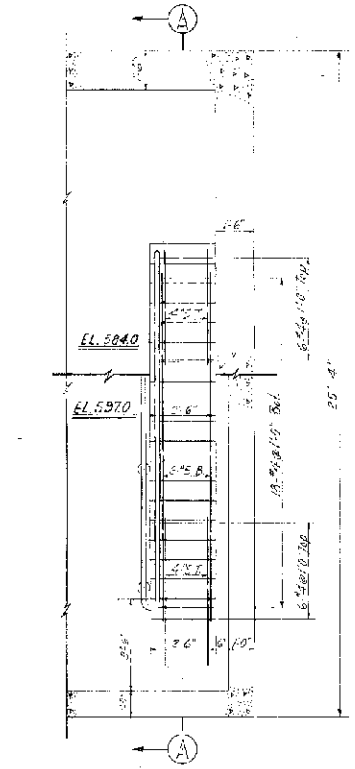
SCALE 1/4" = 1'-0" | SPEC. NO. CIV ENG 19-016-62-19

DRAWING NUMBER CT-1-5774

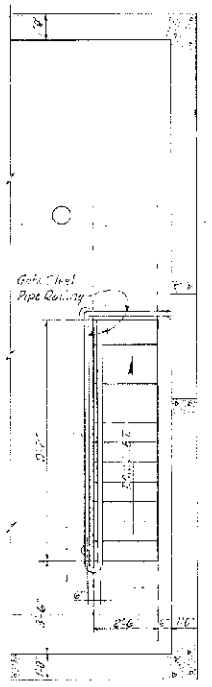
SHEET 58

MODERN BLUE PRINT CO., BOSTON, MASS.

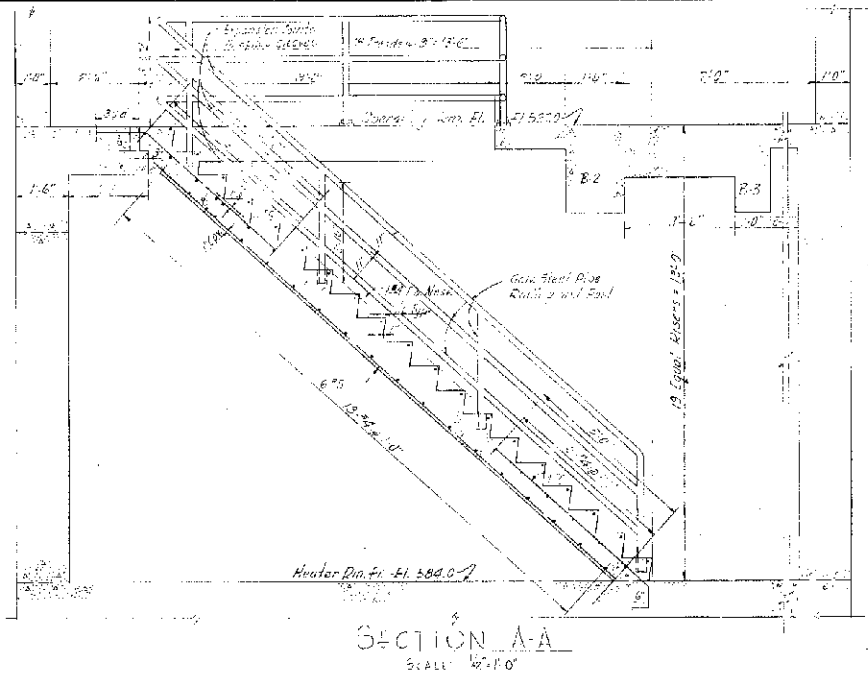
CORPS OF ENGINEERS — U.S. ARMY



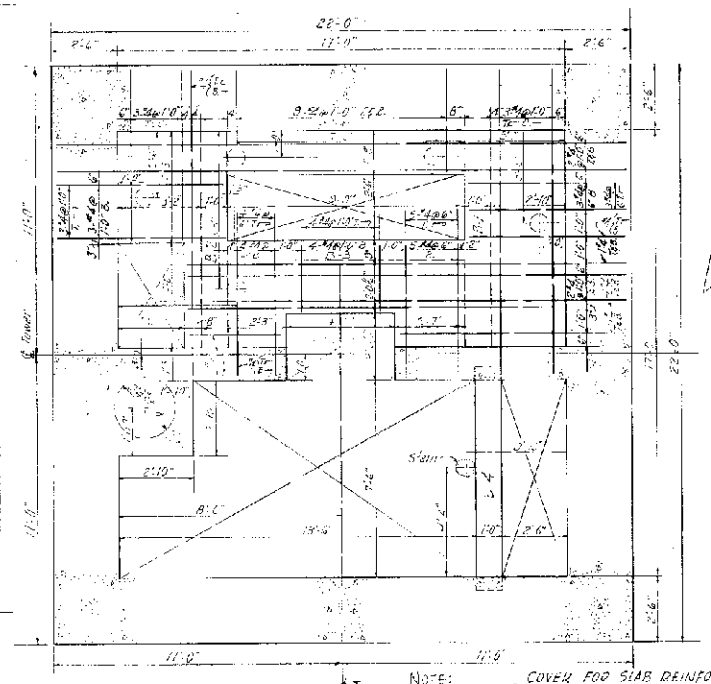
PLAN - EL. 597.0 to EL. 584.0
SCALE: 3/8"=1'-0"



PLAN - EL. 597.0
PIPE RAILING
SCALE: 3/8"=1'-0"

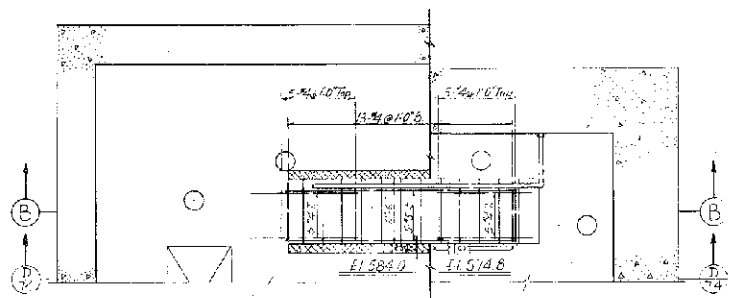


SECTION A-A
SCALE: 1/4"=1'-0"

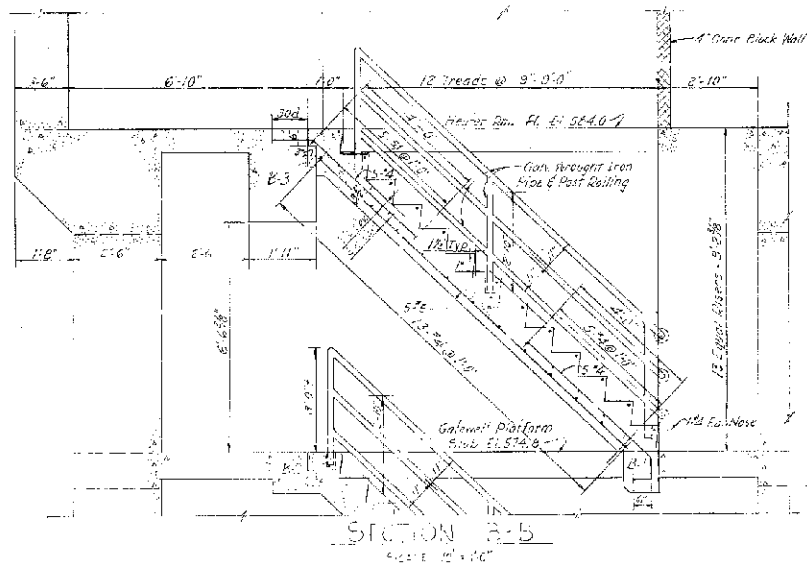


℄ Tower NOTE: COVER FOR SLAB REINFORCEMENT
Top { North-South 2½ / East-West 3½ } Bottom { North-South 2½ / East-West 3" }

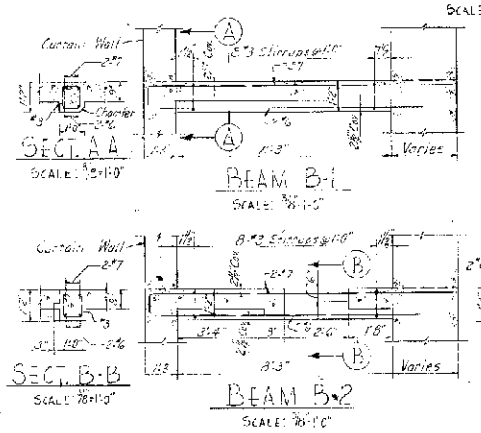
PLAN - GATEWELL PLATFORM LANDING SLAB @ EL. 574.8
SIMILAR FOR GATEWELL PLATFORM SLABS FROM EL. 565.6 TO EL. 473.6
SCALE: 3/8"=1'-0"



PLAN - EL. 584.0 to EL. 574.8
SCALE: 3/8"=1'-0"

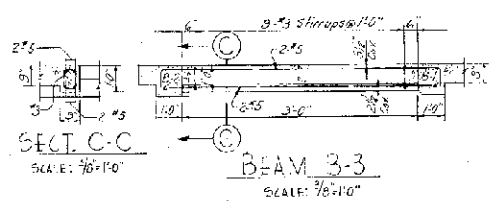


SECTION B-B
SCALE: 1/4"=1'-0"



SECT. A-A
SCALE: 3/8"=1'-0"

BEAM B-1
SCALE: 3/8"=1'-0"

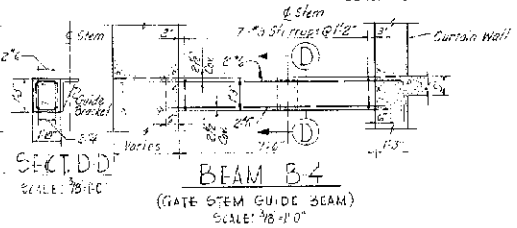


SECT. C-C
SCALE: 3/8"=1'-0"

BEAM 3-3
SCALE: 3/8"=1'-0"

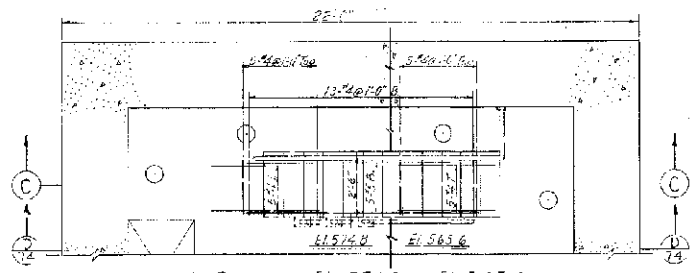
SECT. B-B
SCALE: 3/8"=1'-0"

BEAM B-2
SCALE: 3/8"=1'-0"

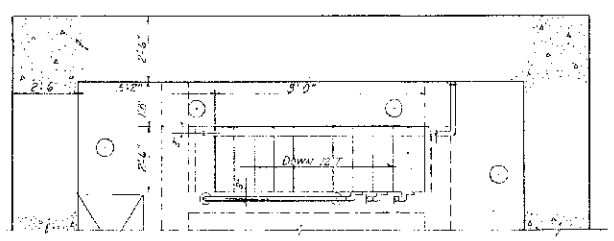


SECT. D-D
SCALE: 3/8"=1'-0"

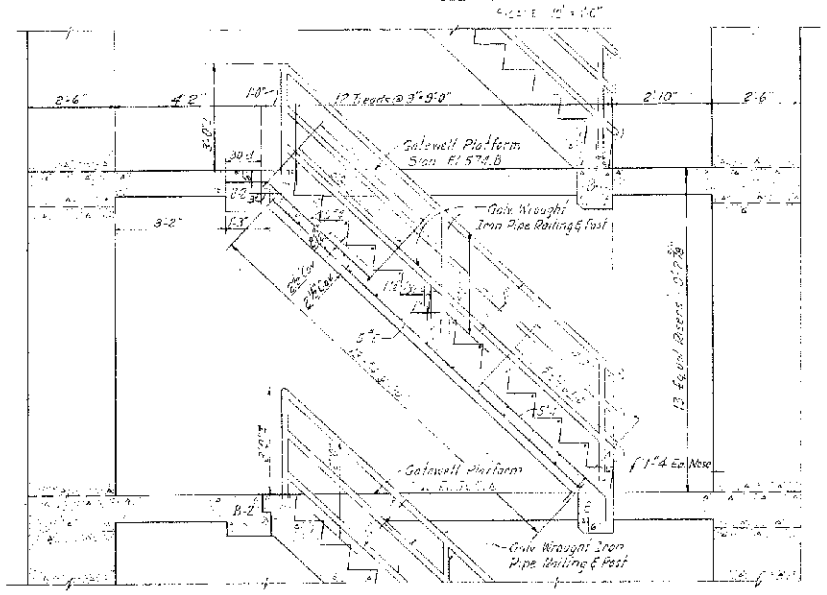
BEAM B-4
(GATE STEM GUIDE BEAM)
SCALE: 3/8"=1'-0"



PLAN - EL. 574.8 to EL. 565.6
SIMILAR FOR GATEWELL STAIRWAY & RAILING FROM EL. 574.8 TO EL. 446.0
SCALE: 3/8"=1'-0"



PLAN - EL. 574.8
PIPE RAILING
SCALE: 3/8"=1'-0"



SECTION C-C
SIMILAR FOR GATEWELL STAIRWAY & RAILING FROM EL. 574.8 TO EL. 446.0
SCALE: 1/4"=1'-0"

GRAPHIC SCALES
3/8"=1'-0"
1/2"=1'-0"

NOTES:

For general notes applying to this sheet except for concrete payment item numbers, see Sheet No. 43.

Payment for concrete shown on this sheet will be made under the following item numbers:- Below El 482 - Item No. 57; Between El 482 & 581 - Item No. 58; Above El 581 - Item No. 59.
See Sheet No. 14 for "Typical Interior Pipe Railing Details".

Payment for pipe railing will be made under Item No. 73.

For typical detail of concrete stairs see "Detail C" on Sheet No. 74.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
R.A.K.	H.L.	A.J.P.

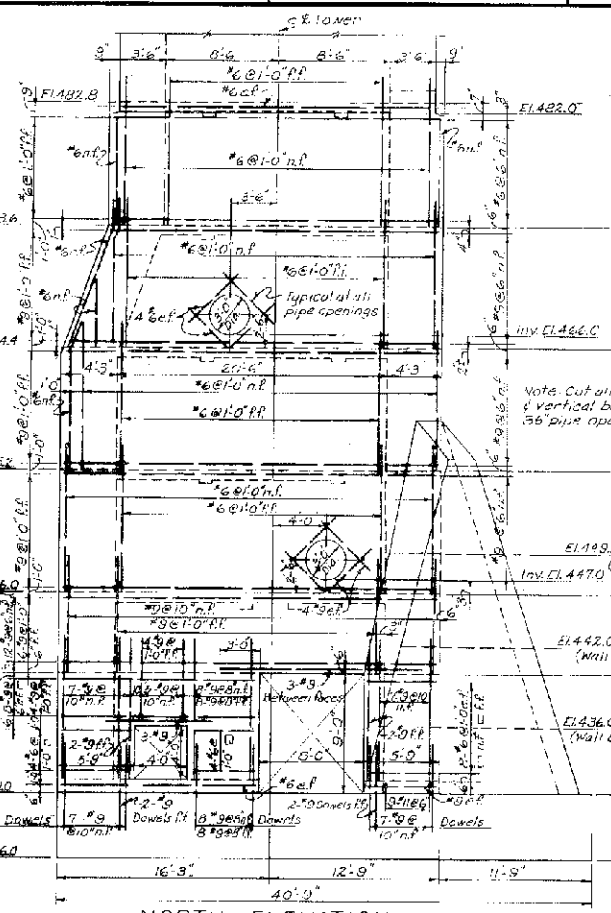
SUBMITTED: CHIEF, ESTIMATE SECTION — PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, DESIGN BRANCH — CHIEF, ENGR. BR. BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION — DATE: MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
PLATFORM & STAIRS-REINFORCING DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5775
SHEET 69

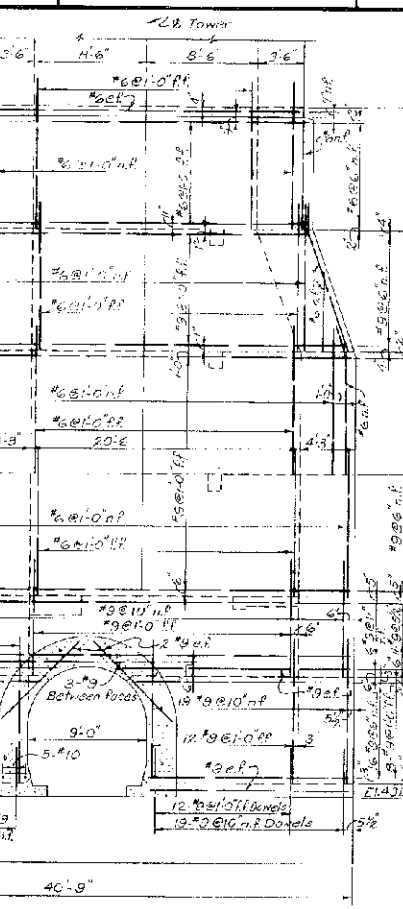
CORPS OF ENGINEERS

U. S. ARMY



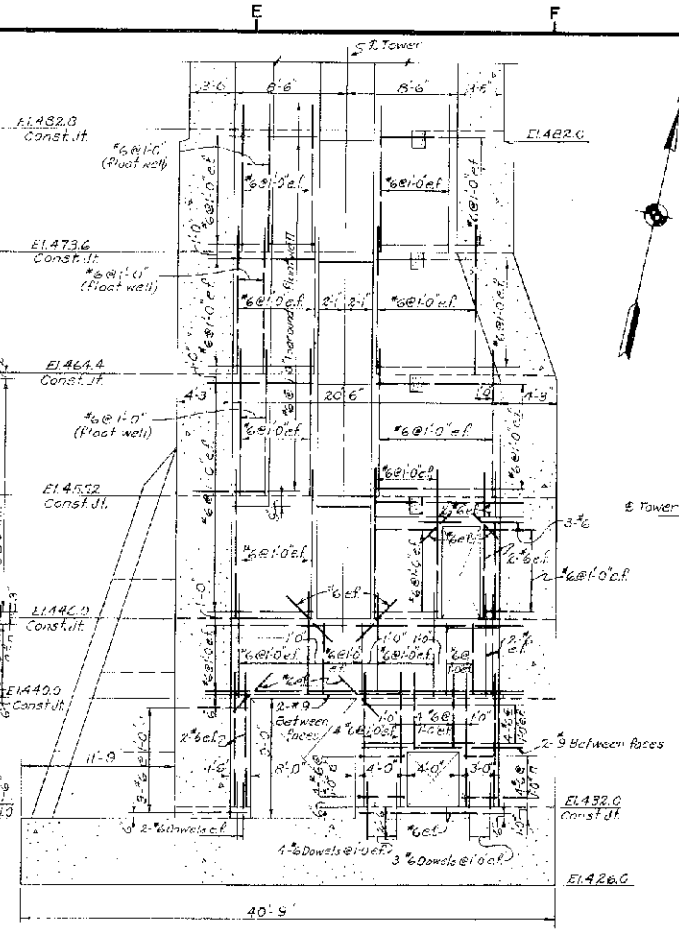
NORTH ELEVATION

SCALE: 3/16"=1'-0"



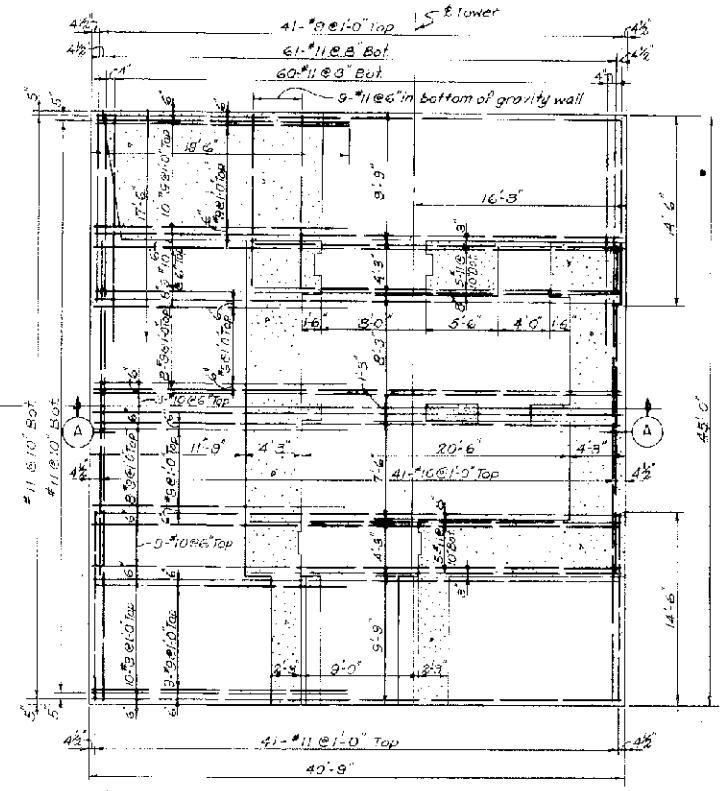
SOUTH ELEVATION

SCALE: 3/16"=1'-0"



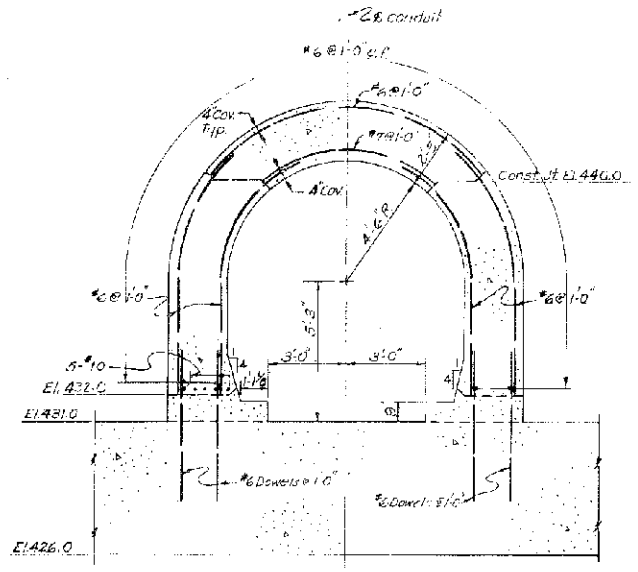
SECTION A-A

SCALE: 3/16"=1'-0"



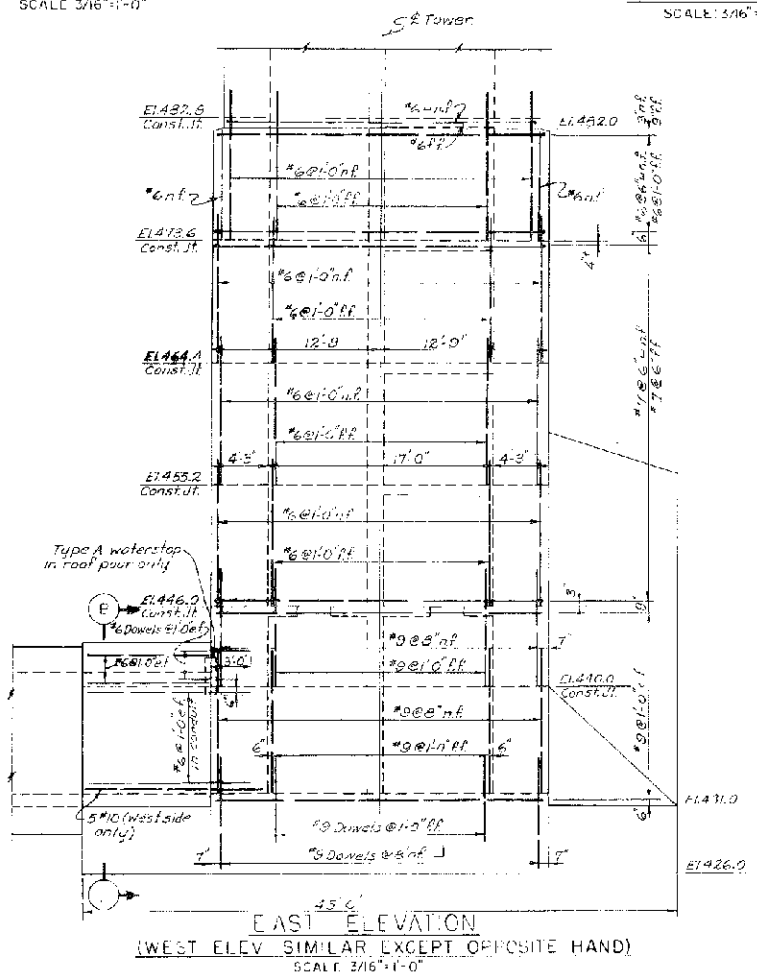
PLAN - BASE SLAB

SCALE: 3/16"=1'-0"



SECTION B-B

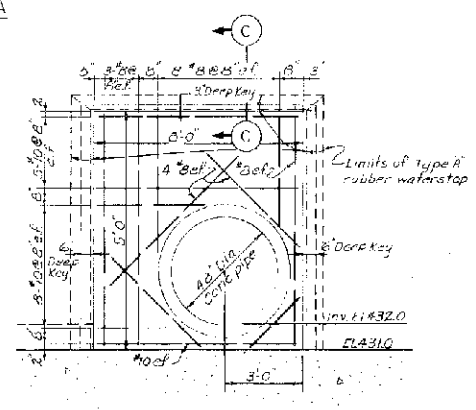
SCALE: 3/8"=1'-0"



EAST ELEVATION

(WEST ELEV. SIMILAR EXCEPT OPPOSITE HAND)

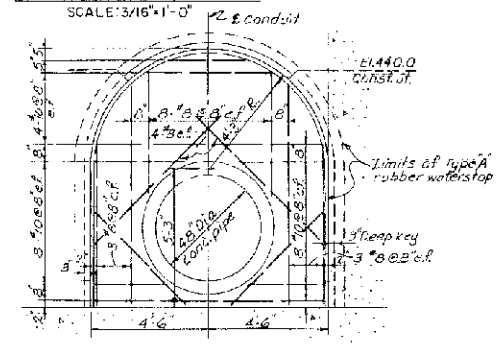
SCALE: 3/16"=1'-0"



NORTH ELEVATION

(PLUG AT NORTH WALL)

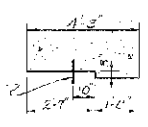
SCALE: 3/8"=1'-0"



NORTH ELEVATION

(PLUG AT SOUTH WALL)

SCALE: 3/8"=1'-0"



SECTION C-C

SCALE: 3/8"=1'-0"

GRAPHIC SCALES

3/16" = 1' 0" 4' 0 4' 8 12

3/8" = 1' 0" 4' 0 4

NOTES:

For general notes applying to this sheet except for contracts payment item numbers, see Sheet No. 49.

Payment for concrete shown on this sheet will be made under the following item numbers—

Below El 482.0 Item No. 49

Above El 482.0 Item No. 50

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.A.K.	J.P.H.	W.T.W.

SUBMITTED: Chief, Struct. Section

PROJECT ENGINEER

APPROVAL RECOMMENDED: Chief, Design Branch

APPROVAL RECOMMENDED: Chief, P. & A. Branch

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

WATER SUPPLY INTAKE TOWER

STRUCTURAL

BASE SLAB & WALL - REINFORCING DETAILS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: Chief, Engineering Division

DATE: MARCH 1962

SCALE AS SHOWN | SPEC. NO. DIV. ENG. 19-016-22-49

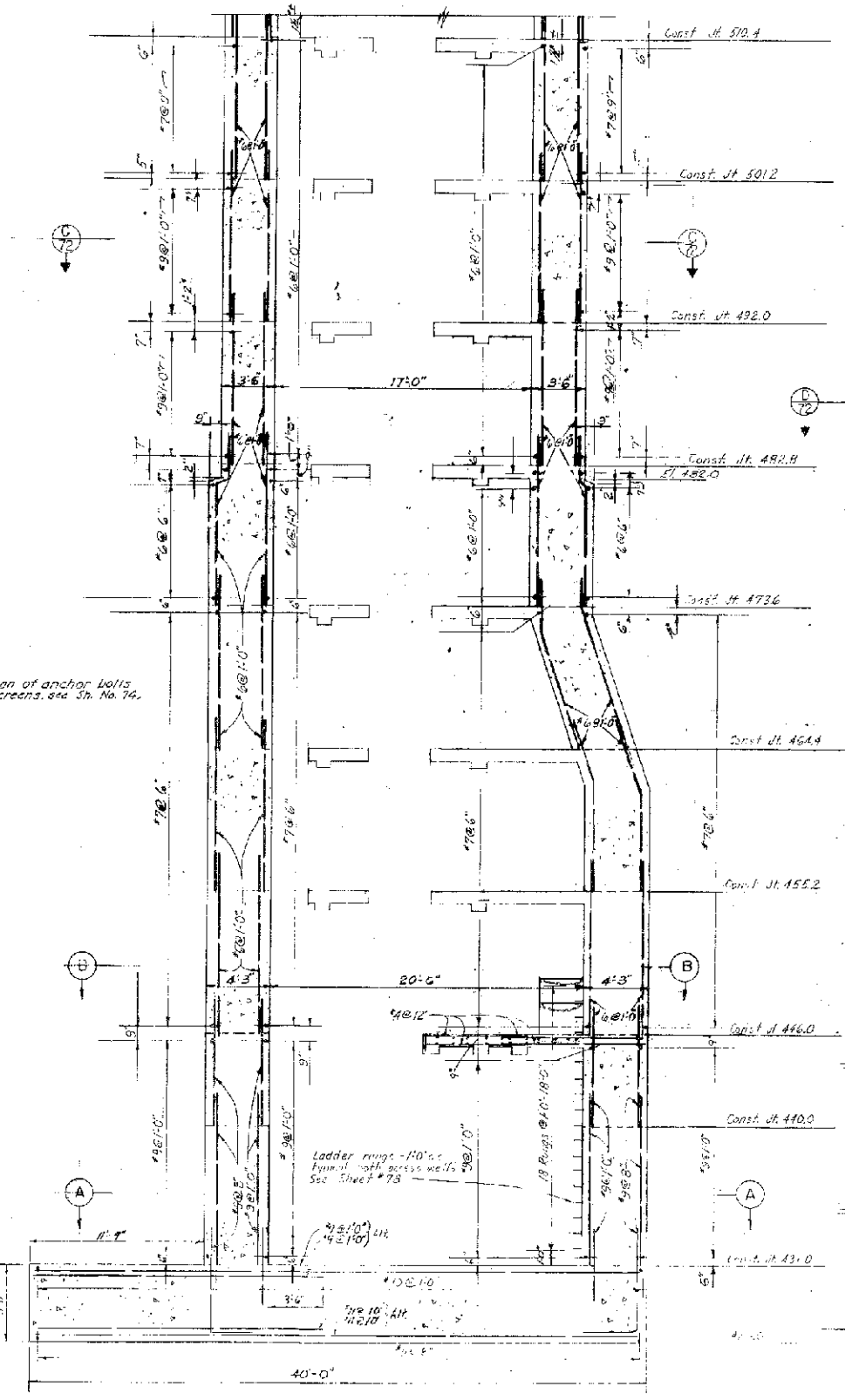
DRAWING NUMBER

CT-1-5776

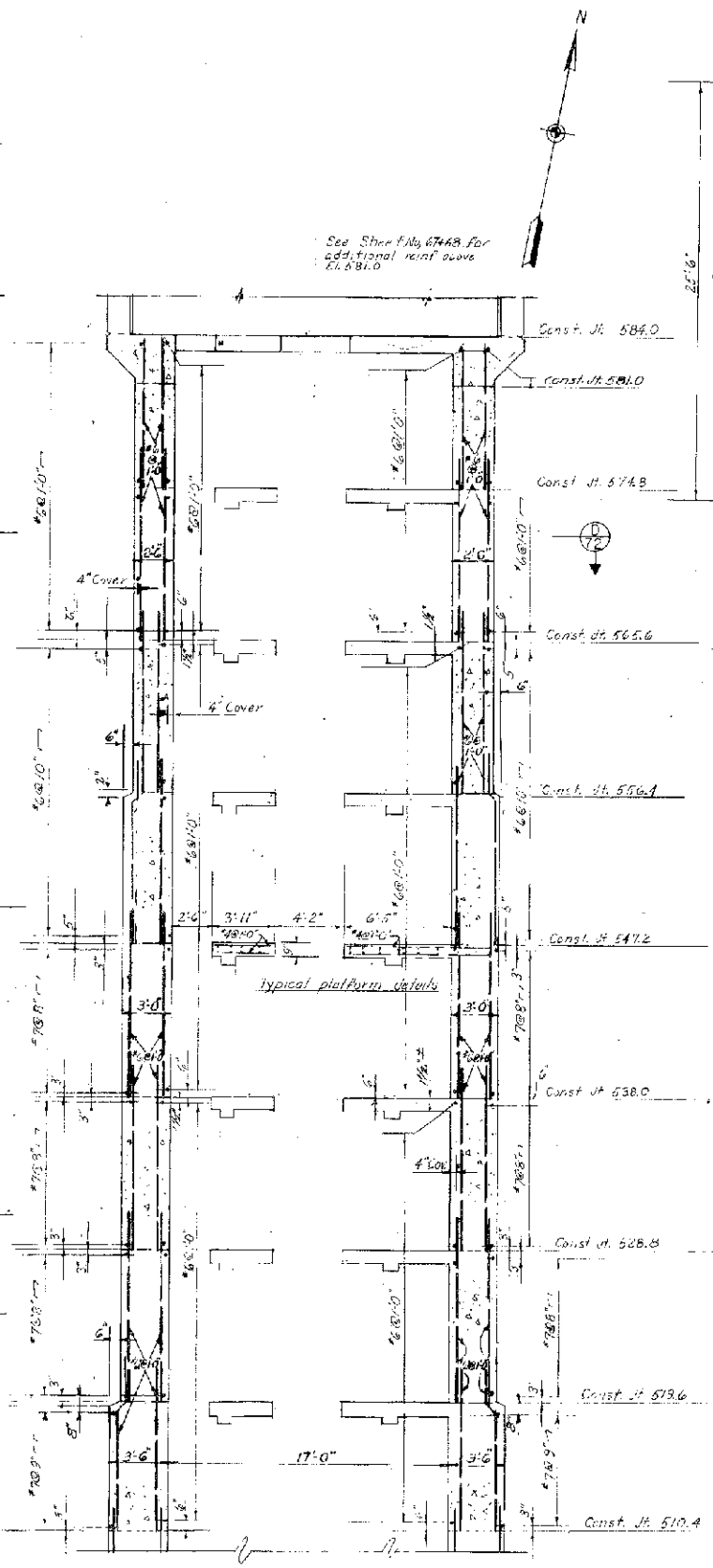
SHEET 70

CORPS OF ENGINEERS

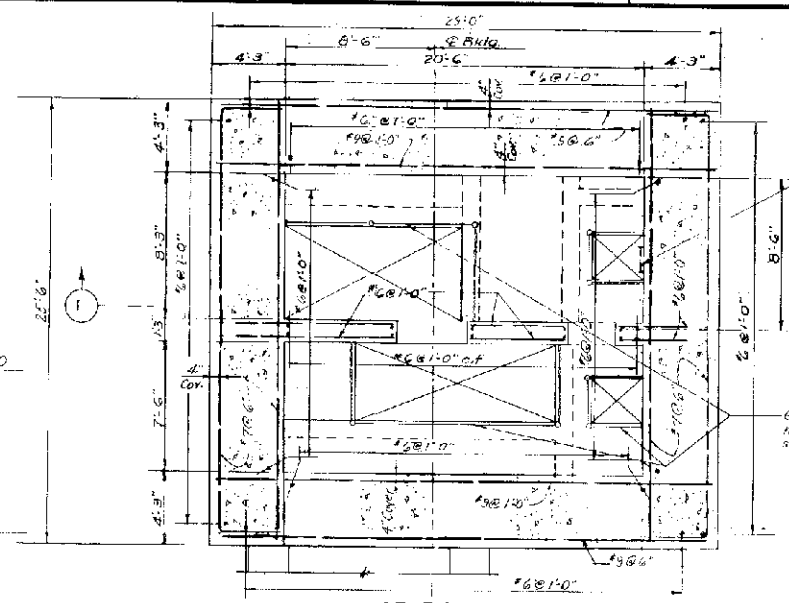
U. S. ARMY



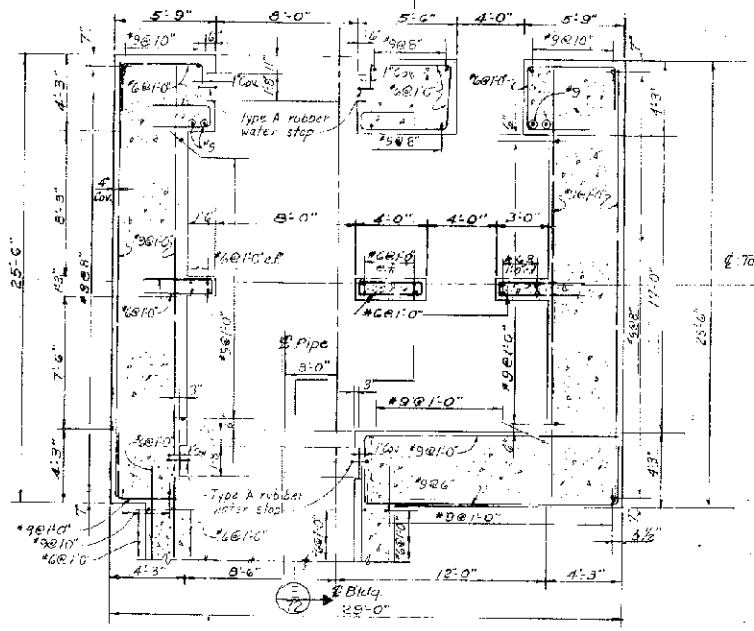
PART SECTION I-F



PART-SECTION F-F



SECTION B-B



SECTION A-A

GRAPHIC SCALES

1" = 1'-0"

1/4"=1'-0"

NOTES

For general notes applying to this sheet except for concrete payment item numbers, see Sheet No. 18.
Payment for concrete shown on this sheet will be made under the following item numbers - Below El. 482 Item No. 57 between El. 482 and El. 501 Item 58 - Above El. 501 Item 59.
For details of rubber water stops see Sheet No. 90. Pour concrete for plug tight against joint without mastic coating.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY M.A.K. | DR. BY A.J.Z. | CK. BY

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
VERTICAL SECTIONS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED DATE MARCH 962

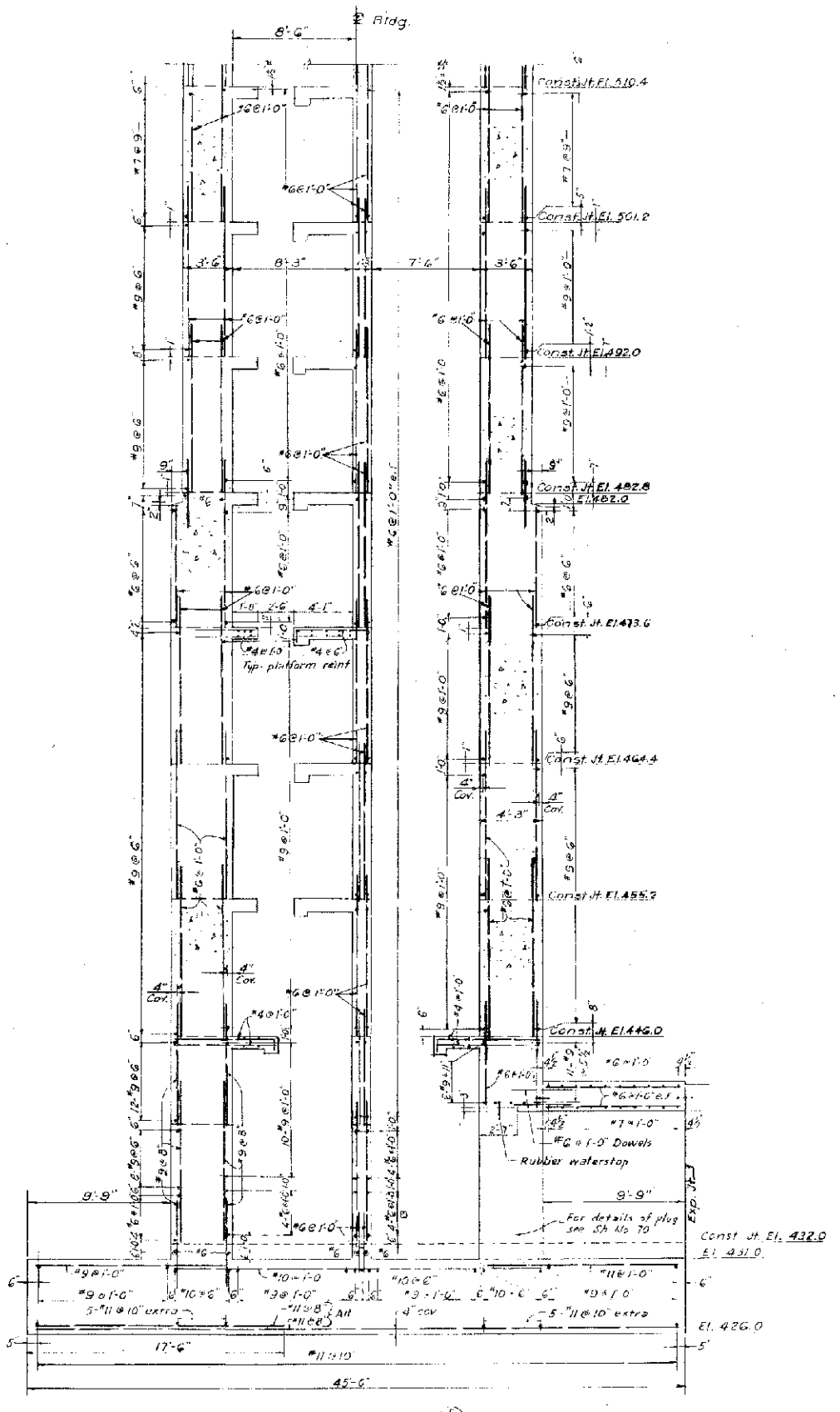
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5777

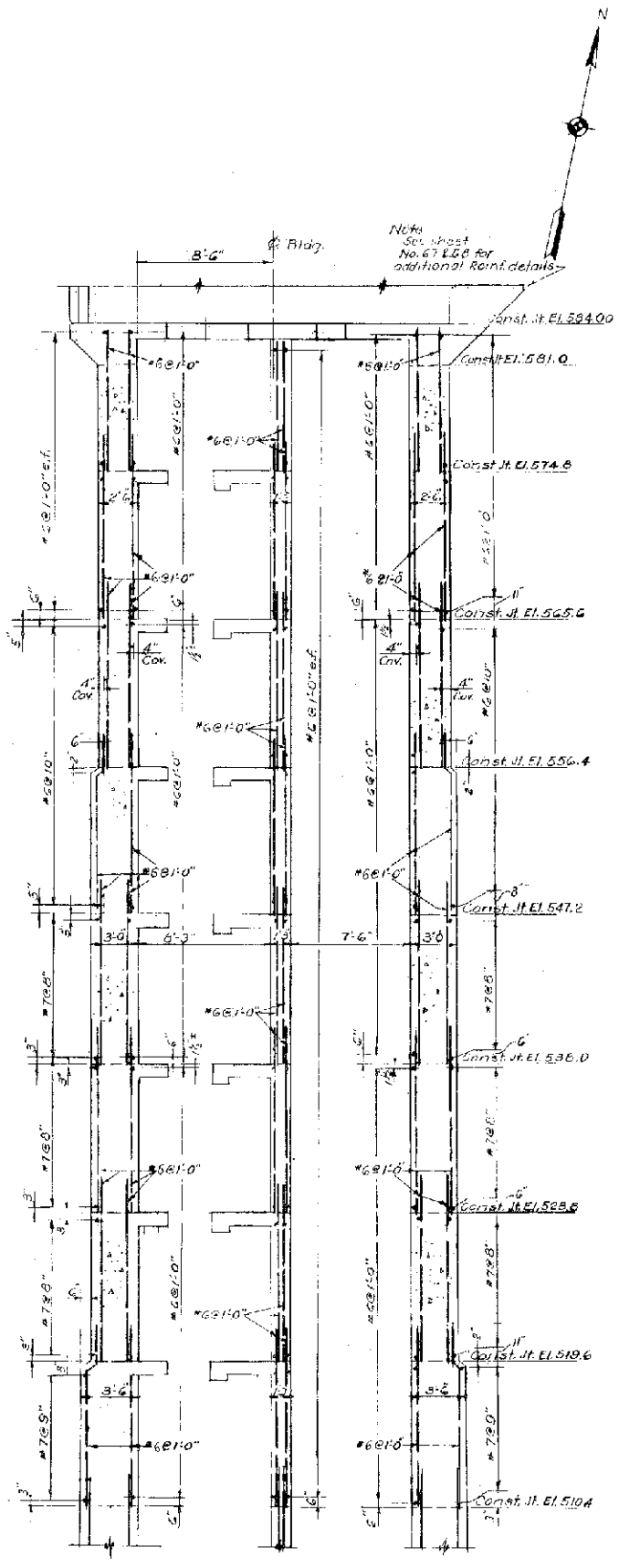
SHEET 71

CORPS OF ENGINEERS

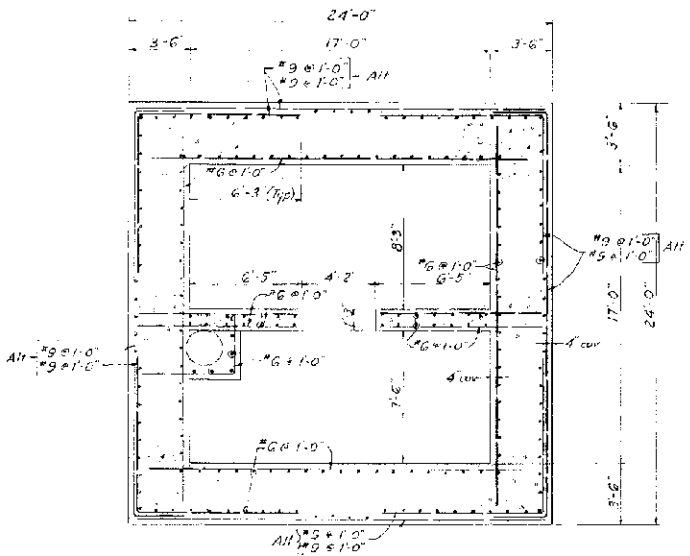
U. S. ARMY



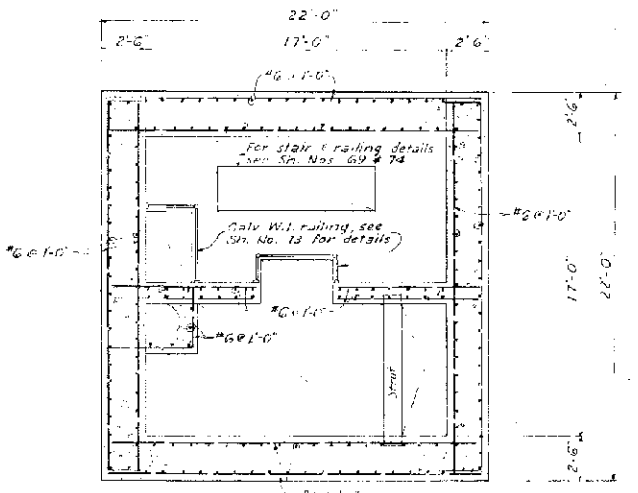
PART SECTION (L/71)
SCALE 1/4"=1'-0"



PART SECTION (C/71)
SCALE 1/4"=1'-0"



SECTION (G/71)
SCALE 1/4"=1'-0"
Typical Between El. 482.8 - El. 501.2



SECTION (D/71)
SCALE 1/4"=1'-0"

NOTE:
Arrangement of steel is typical between El. 501.2 and El. 584.0. For size see Vertical Sections.

NOTES:
For General Notes applying to this sheet except for concrete payment item numbers, see Sh. No. 49
Payment for concrete shown on this sheet will be made under the following item numbers:—
Below El 482.0 Item No. 57
Between El 482.8 & El 581.0 Item No. 58
Above El 581.0 Item No. 59

GRAPHIC SCALE
1/4"=1'-0" 4 0 4' 8'
1"=1'-0" 1" 2' 2'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.A.K. DR. BY A.J.T. CH. BY W.C.
SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
STRUCTURAL
VERTICAL SECTIONS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-C-2-19
DRAWING NUMBER
CT-I-5778
SHEET 72

CORPS OF ENGINEERS

U. S. ARMY

Rights of way will be provided from Borrow areas to Contractor's Work Area as required

BORROW AREA "C"

BORROW AREA "B"

RELOCATED GOSS HILL ROAD

OPERATOR'S QUARTERS

Limit of Contractor's Work Area

N 51,411
E 50,919

Limit of Clearing for Log Boom

N 50,355
E 48,892

WINCHELL BROOM

EAST RIVER ROAD

HAMPDEN COUNTY
HAMPSHIRE COUNTY

TOWN OF CHESTER
TOWN OF HUNTINGTON

Rock Spillway Area

SPOIL AREA
(For limits see Sh. No. 8)

Temporary Right of Way

All existing standing timber within limits to be cut and removed from Contractor's Work Area below El. 1520.

INTAKE CHANNEL

WATER SUPPLY INTAKE TOWER

SERVICE BRIDGE

CONTROL WEIR
Crest 518.0'

SPILLWAY — Crest El. 576.0

9'-0" DIA. TUNNEL

FLOOD CONTROL GATE SHAFT

TRANSFORMER STATION

MAINTENANCE ROAD

ROTARY

DAM Top El. 596.0

FLAG POLE
PARKING AREA
ACCESS BRIDGE
OUTLET PORTAL

9'-0" DIA CONDUIT

ACCESS ROAD

PARKING AREA

OUTLET PORTAL

DISCHARGE CHANNEL

Area to be cleared

Prepared Log Storage

TURNAROUND

NORTH CHESTER ROAD

To Littleville

To Huntington

To Huntington

MIDDLE BRANCH — WESTFIELD RIVER

Limit of Contractor's Work Area

N51,000
N50,800
N50,600
N50,000
N49,500
N49,000

E49,000
E49,500
E50,000
E50,500
E51,000
E51,500

LEGEND

- 550 — Contour (approx. existing ground surface)
- - 550 - - Contour (approx. existing ground surface in structure areas)
- Earth or Rock Cut
- Earth Fill
- Rock Slope Protection
- Rock Outcrop

NOTES

Elevations refer to Mean Sea Level Datum

Coordinates are based on a local grid. Origin is County Bound of intersection Hampden and Hampshire Counties and is designated as N 50,000 - E 50,000

Contour interval 5 feet

For Embankment Sections see Sheet No. 25

For Dike Sections and Access Road see Sheet No. 29

For Spillway Plan and Sections see Sheet No. 31

For Flood Control Structures see Sheets No. 38 - 59

For Water Supply Structures see Sheets No. 60 - 83

For Utility Building see Sheets No. 99 - 105

For Log Boom see Sheet No. 27

For Operator's Quarters see Sheets No. 106 - 111

For Goss Hill Road relocation and improvement see Sheets No. 94 - 97

For Borrow Area "B" see Sheet No. 20

For Borrow Area "C" see Sheet No. 21

For Spoil Area see Sheet No. 8

Top of Dam El. 596.0

GRAPHIC SCALE
1" = 100'
0 100' 200'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY K.H.W | DR. BY K.H.W | SK. BY

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GENERAL PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

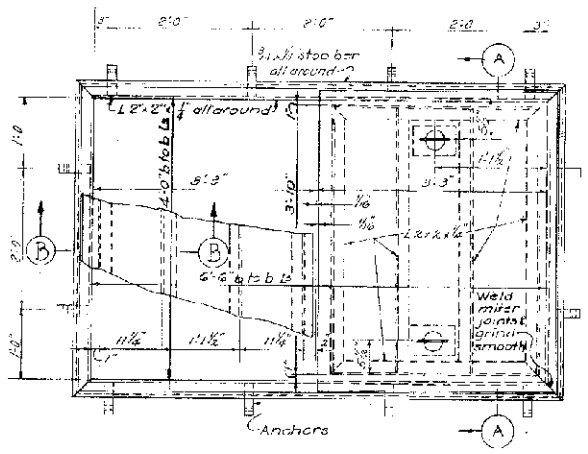
APPROVED: DATE MARCH 1962
CHIEF, ENGINEERING DIVISION

SCALE: 1" = 100' | SPEC. NO. CIV. ENG. 19-016-62-52

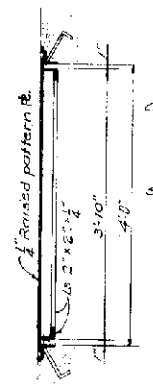
DRAWING NUMBER
CT-1-5725

SHEET 2

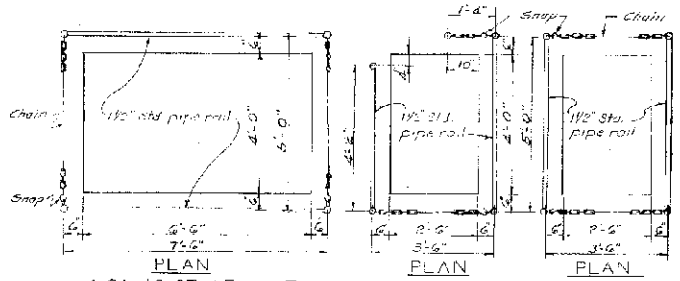
CORPS OF ENGINEERS — U.S. ARMY



NO.1 HOIST WELL FRAME & COVER
SCALE 1"=1'-0"



SECTION A-A
SCALE 1"=1'-0"

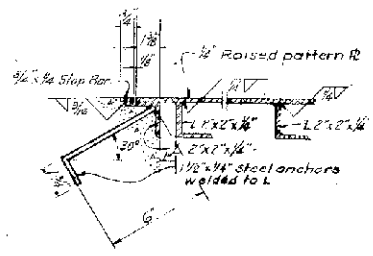


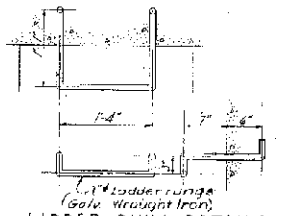
PLAN
NO.1 HOIST WELL AT OPERATING FLOOR & AT BASEMENT FLOOR

PLAN
NO.2 HOIST WELL AT OPERATING FLOOR

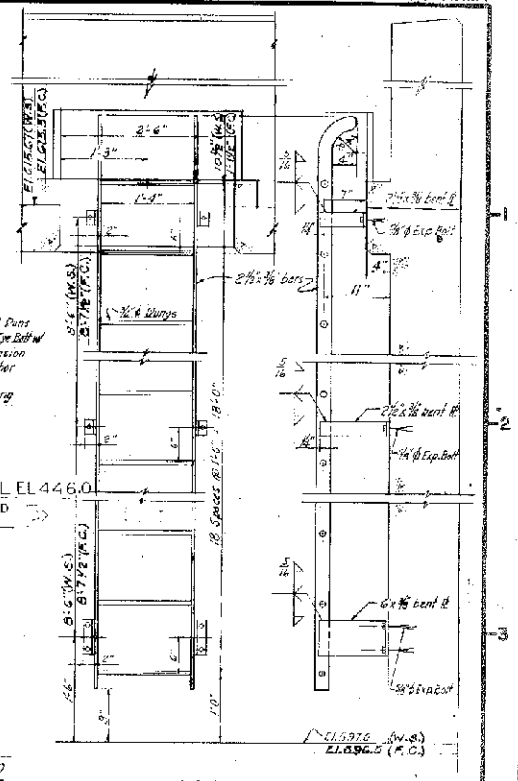
PLAN
NO.2 HOIST WELL AT BASEMENT FLOOR

PORTABLE HATCHWAY GUARDS AT OPERATING FLOOR & AT BASEMENT FLOOR
SCALE 1/2"=1'-0"

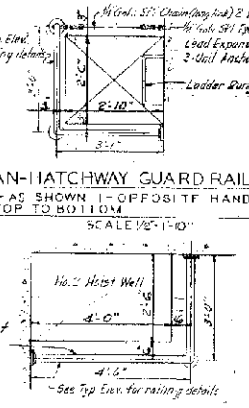




LADDER RUNG DETAILS
SCALE 1"=1'-0"

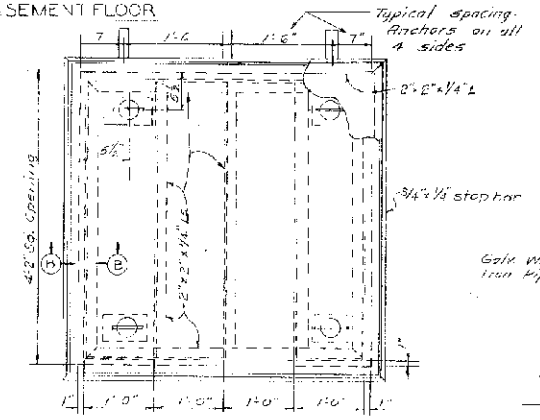


STEEL ROOF LADDER
FOR WATER SUPPLY TOWER (W.S.) AS SHOWN
FOR FLOOD CONTROL TOWER (F.C.) AS SHOWN
SCALE 1"=1'-0"

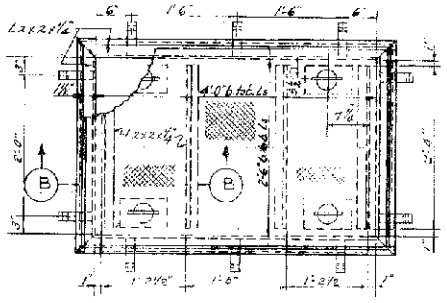


PLAN - HATCHWAY GUARD RAIL AT EL. 574.8 THRU EL. 455.2
SCALE 1/2"=1'-0"

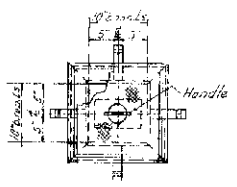
PLAN-HATCHWAY GUARD RAIL EL. 446.0
1-AS SHOWN 1-OPPOSITE HAND
TOP TO BOTTOM
SCALE 1/2"=1'-0"



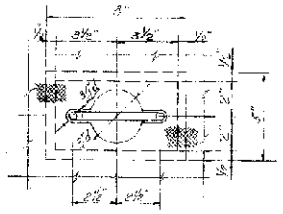
OPERATING FLOOR FRAME & COVER SCREEN OPNG.
SCALE 1"=1'-0"



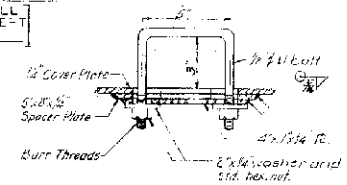
NO.2 HOIST WELL FRAME AND COVER
(SIMILAR TO NO.1 HOIST WELL FRAME & COVER EXCEPT AS NOTED)
SCALE 1"=1'-0"



GATE HOIST STEM ACCESS FRAME & COVER (2 EA. REQ'D)
SIMILAR TO NO.1 HOIST WELL FRAME AND COVER EXCEPT AS NOTED
SCALE 1"=1'-0"

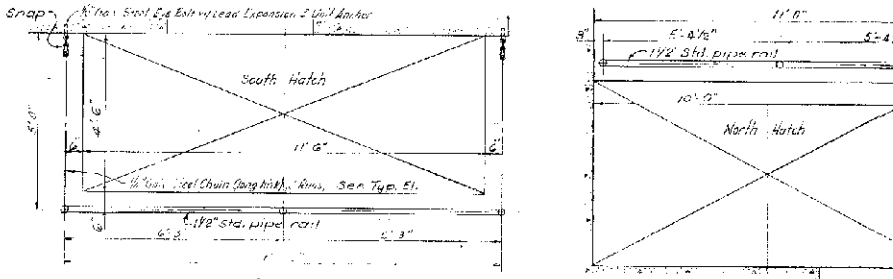


PLAN

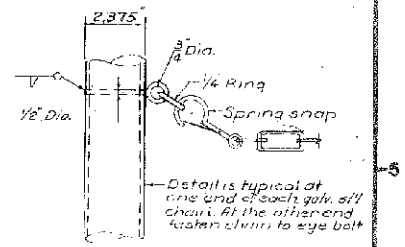


SECTION

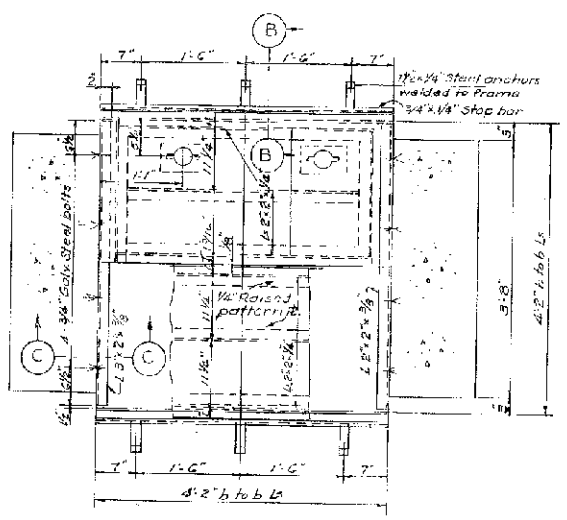
HANDLE DETAILS FOR COVERS
SCALE 3"=1'-0"



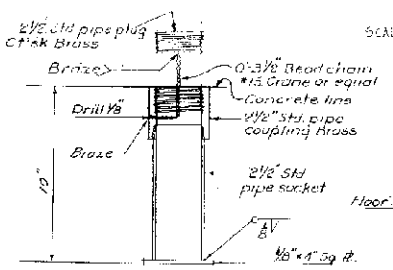
PLAN - PORTABLE HATCHWAY GUARDS AT EL. 446.0



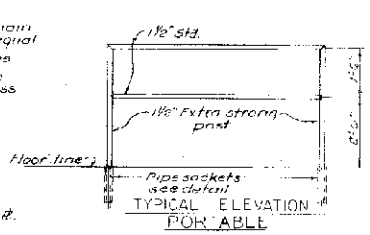
EYE BOLT
FOR PORTABLE HATCH WAY GUARD
SCALE 3"=1'-0" (73)



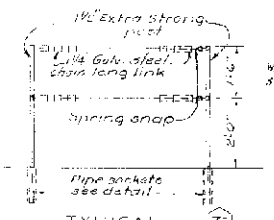
HATCH COVER FOR TRAVELING SCREEN OPENING (HEATER RM.)
SCALE 1"=1'-0"



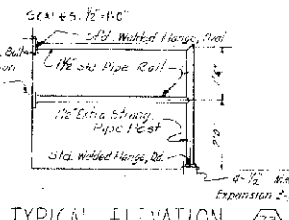
HATCHWAY GUARD PIPE SOCKET
SCALE 3"=1'-0" (75)



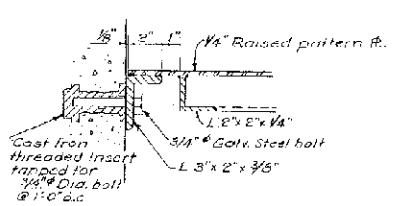
TYPICAL ELEVATION FOR PORTABLE HATCHWAY GUARD
SCALE 1/2"=1'-0"
(73)



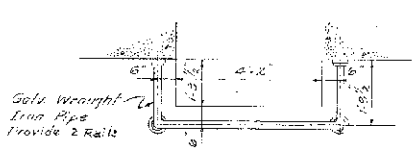
TYPICAL END ELEVATION
SCALE 1/2"=1'-0"
(73)



TYPICAL ELEVATION (73)
HATCHWAY GUARD RAIL
SCALE 1/2"=1'-0"



SECTION C-C
SCALE 3/4"=1'-0"



PLAN TRAVELING SCREEN GUARD RAIL AT EL. 574.8 THRU EL. 455.2
SCALE 1/2"=1'-0"

NOTES:
All material shall be steel except as noted otherwise
Payment for all items on this sheet will be made under item #74 unless noted otherwise.
Figures in hexagons indicate item numbers under which payments will be made.
Elevations refer to Mean Sea Level Datum.

GRAPHIC SCALES
1/2" = 1'-0"
1" = 1'-0"
3" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY B.A.K. | DR. BY H.L. | CK. BY C.C.K.
SUBMITTED: [illegible] CHIEF, STRUCT. SECTION
PROJECT ENGINEER
RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED: CHIEF, E & D BRANCH

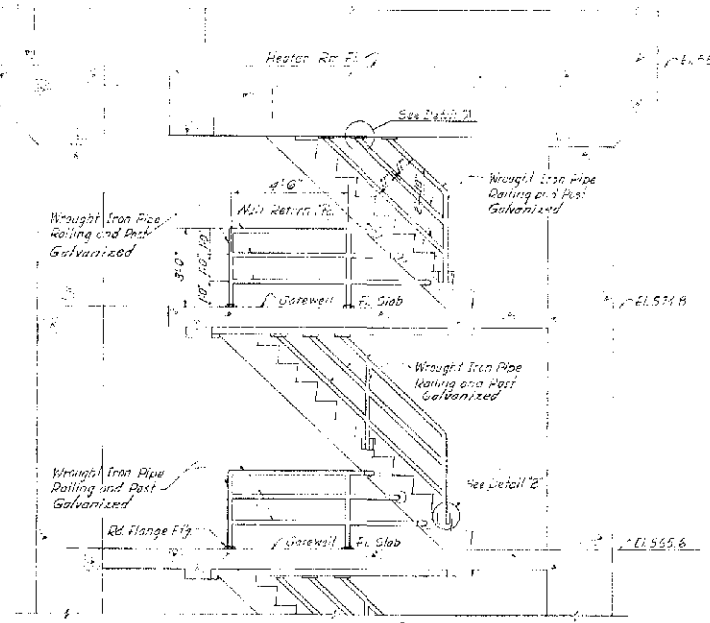
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT
MISCELLANEOUS METALS-DETAILS NO.1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: [illegible] CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

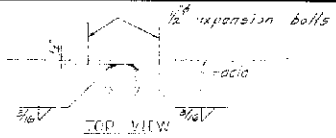
SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-63-2-59
DRAWING NUMBER
CT-1-5779
SHEET 73

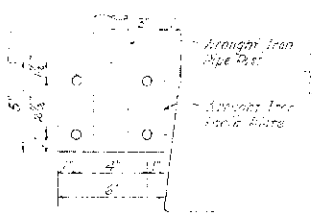
NEW ENGLAND BLUE PRINT CO., BOSTON, MASS.

CORPS OF ENGINEERS — U. S. ARMY

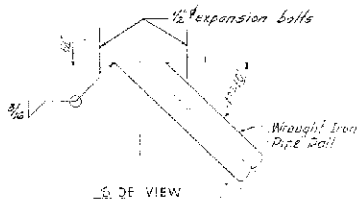


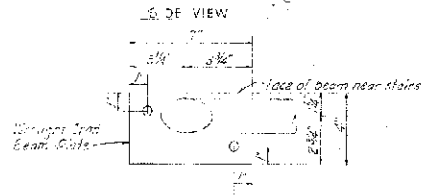
SECTION (B)
(TYPICAL TO EL. 446.0)
SCALE: 3/8"=1'-0"



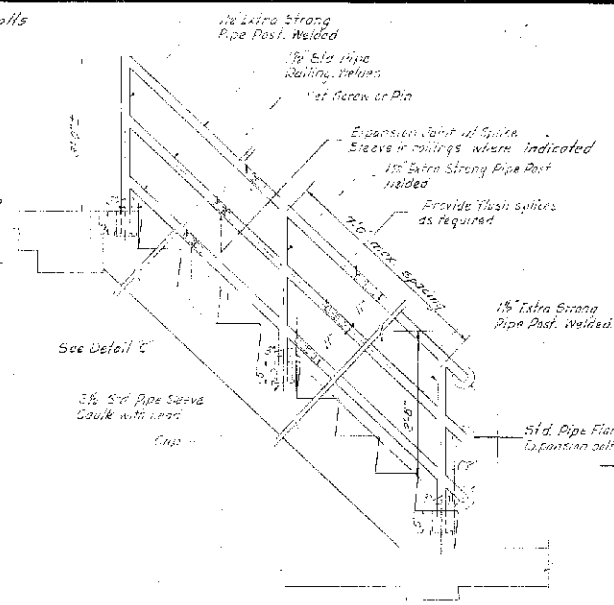


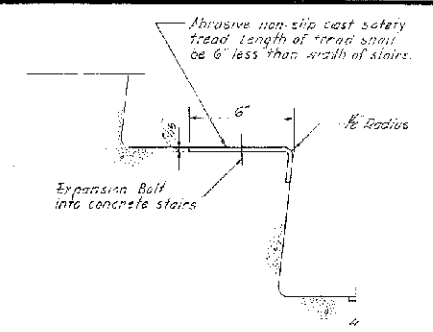
DETAIL "B"
SCALE 3"=1'-0"



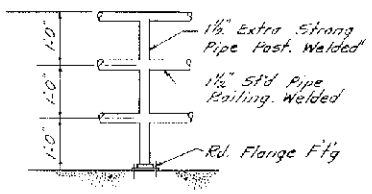


DETAIL "A"
SCALE: 3"=1'-0"

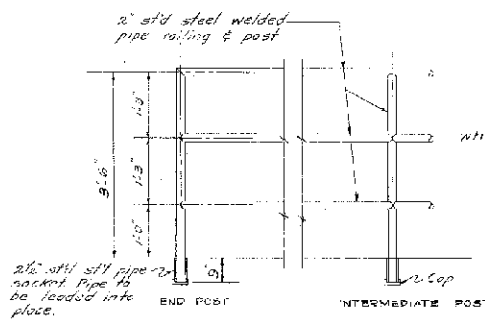




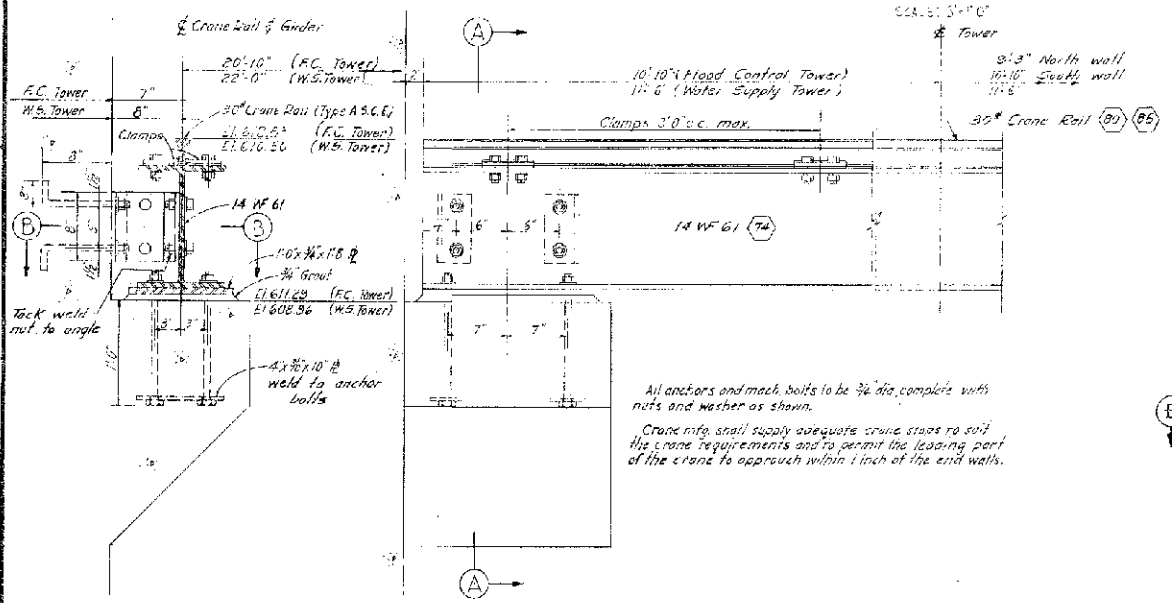
DETAIL "C"
(TYP. FOR ALL INT. CONC. STAIRS & EXT. STAIRS SHOWN ON SH. NO. 39)
SCALE: 3"=1'-0"



TYPICAL INTERIOR PIPE RAILING DETAILS
SCALE: 3/4"=1'-0"

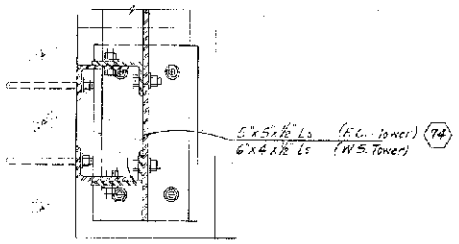


TYPICAL EXTERIOR PIPE RAILING DETAILS
SCALE 3/4"=1'-0"

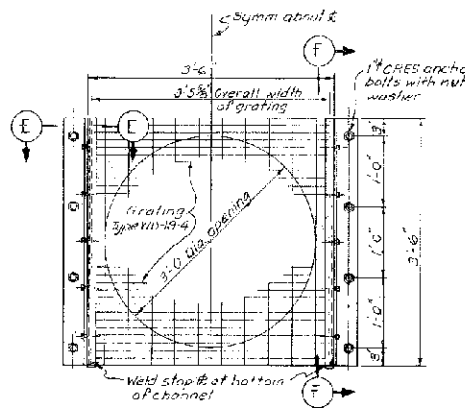


SECTION A-A
SCALE: 1½"=1'-0"

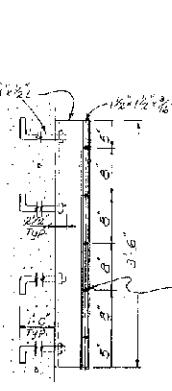
ELEVATION OF CRANE RAIL & GIRDER
SCALE: 1½"=1'-0"



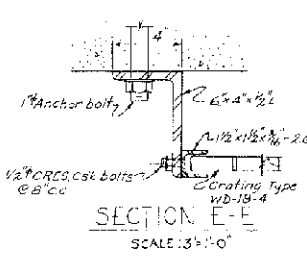
SECTION B-B
SCALE: 1½"=1'-0"



INTAKE SCREEN (74)
SCALE: 1"=1'-0"



SECTION F-F
SCALE: 1"=1'-0"



SECTION E-E
SCALE: 1½"=1'-0"

NOTES:

All elevations refer to Mean Sea Level Datum.
Figures in hexagons refer to payment items under which payment will be made.
Payment for all items shown on this sheet will be made under Item No 73 unless otherwise noted

GRAPHIC SCALES

3/8" = 1'-0"
3/4" = 1'-0"
1 1/2" = 1'-0"
3" = 1'-0"
1" = 1'-0

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY R.A.K. | DR. BY H.L. | CK. BY

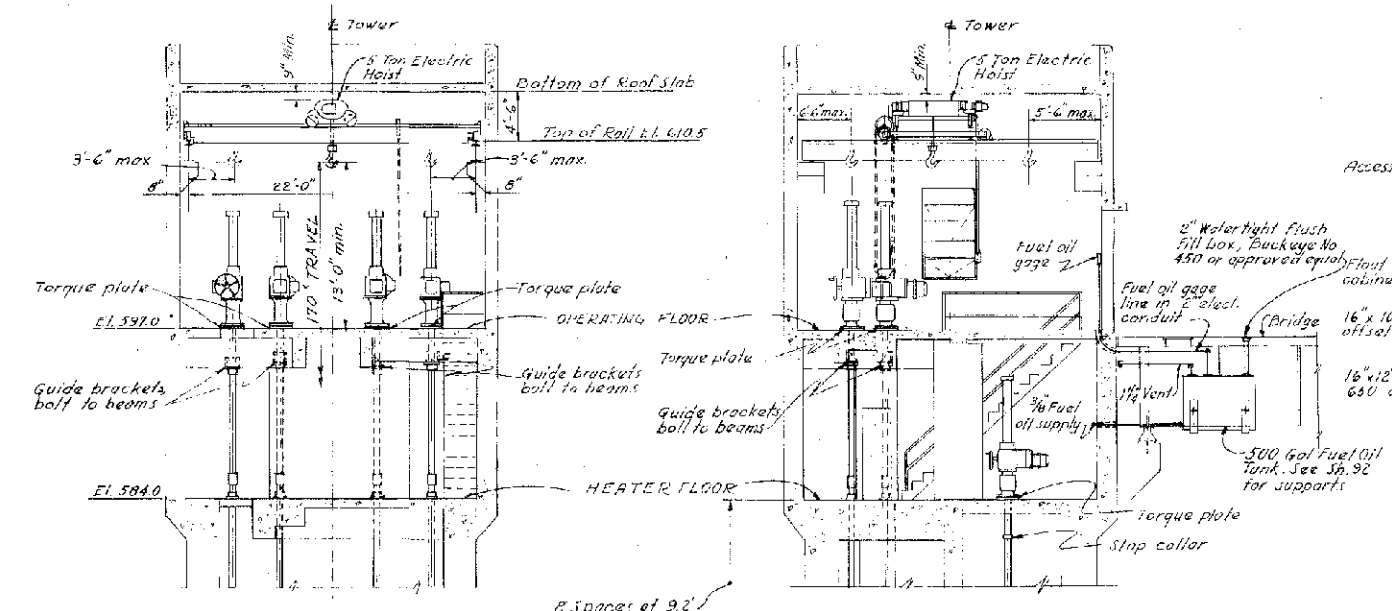
SUBMITTED: Chief, Design Section
PROJECT ENGINEER
RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Eng. Div.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER AND FLOOD CONTROL GATE SHAFT
STRUCTURAL-MISC. METALS-DETAILS NO 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

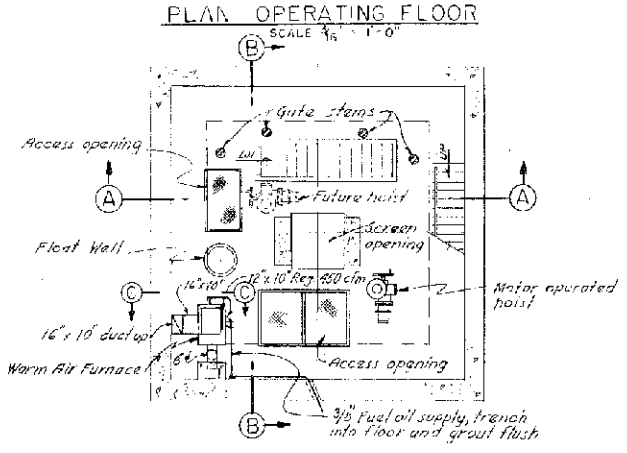
APPROVED: Chief, Eng. Division
DATE: MARCH 1952

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER: CT-1-5780
SHEET 74

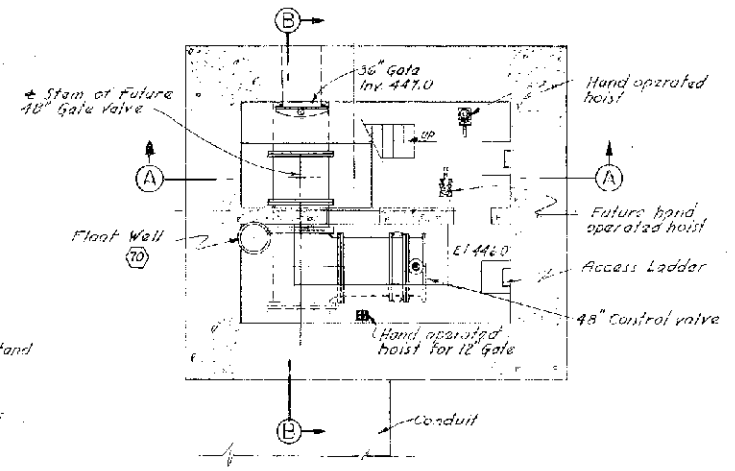
CORPS OF ENGINEERS — U. S. ARMY



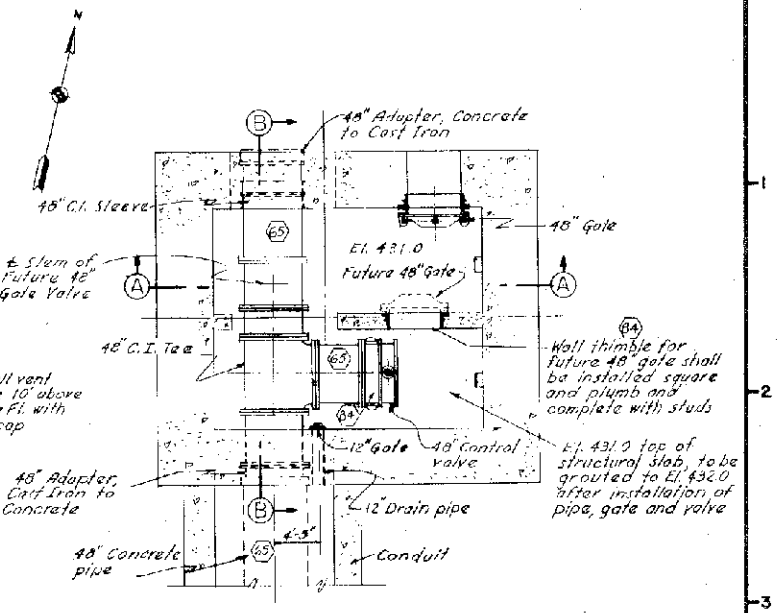
PLAN OPERATING FLOOR
SCALE 3/16" = 1'-0"



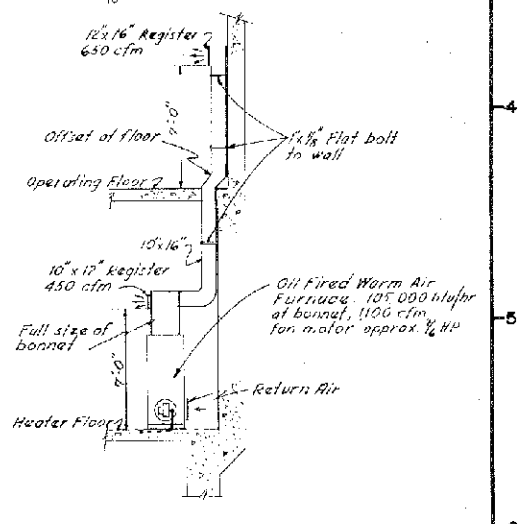
PLAN - HEATER FLOOR
SCALE 3/16" = 1'-0"



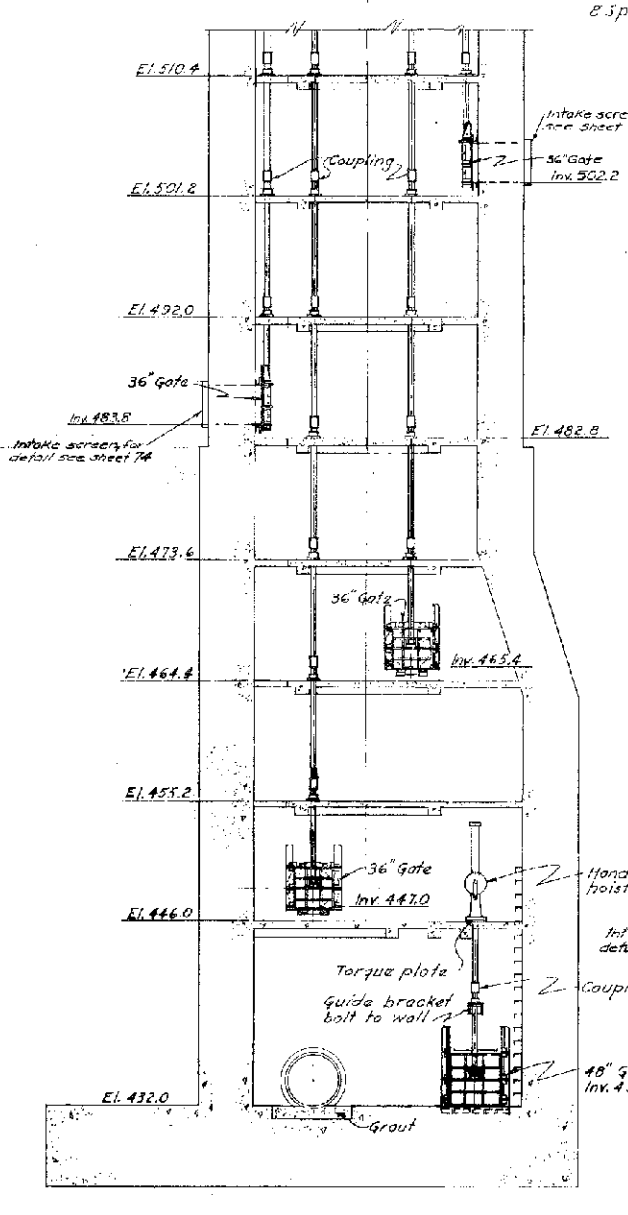
PLAN - ELEV. 446
SCALE 3/16" = 1'-0"



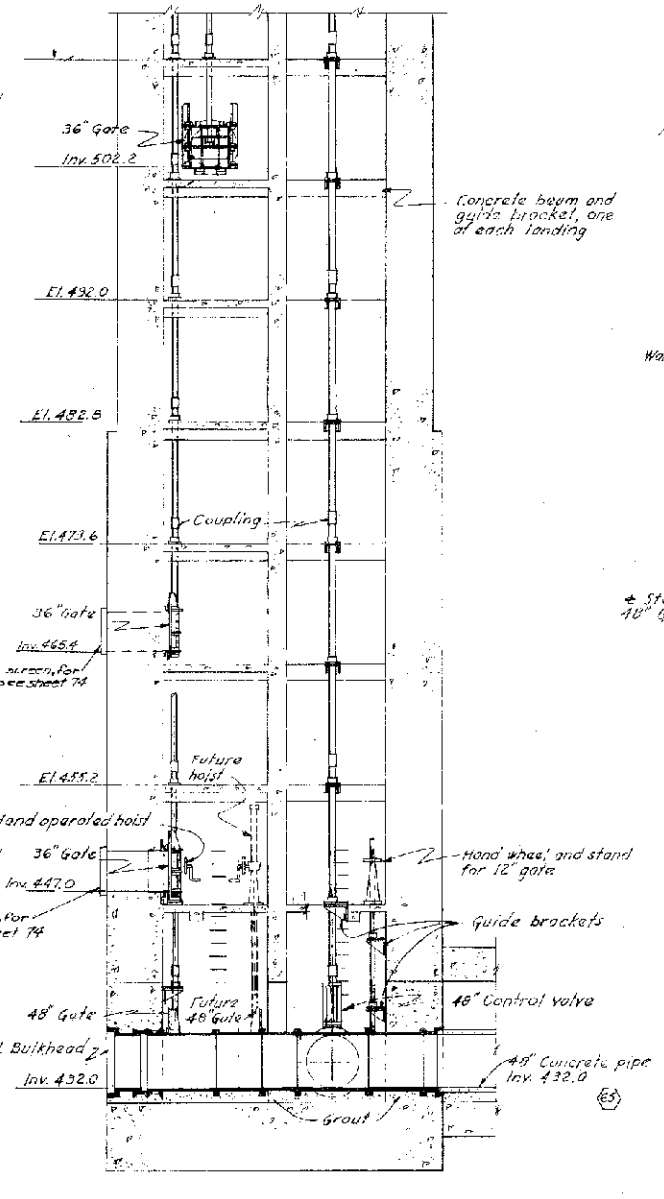
PLAN - ELEV. 431 & 432
SCALE 3/16" = 1'-0"



SECTION C-C
SCALE ¼"=1'-0"



SECTION A-A
SCALE 3/16" = 1'-0"



SECTION B-B
SCALE 3/16" = 1'-0"

GRAPHIC SCALE
1/4"=1'-0" 0 4'
3/16"=1'-0" 0 6'

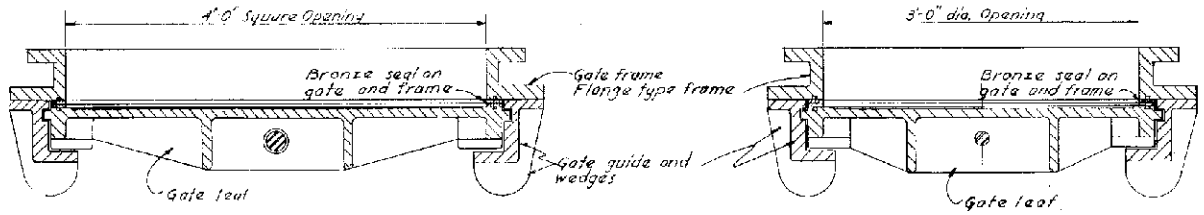
NOTE
For payment item numbers see Sheet No. 76.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

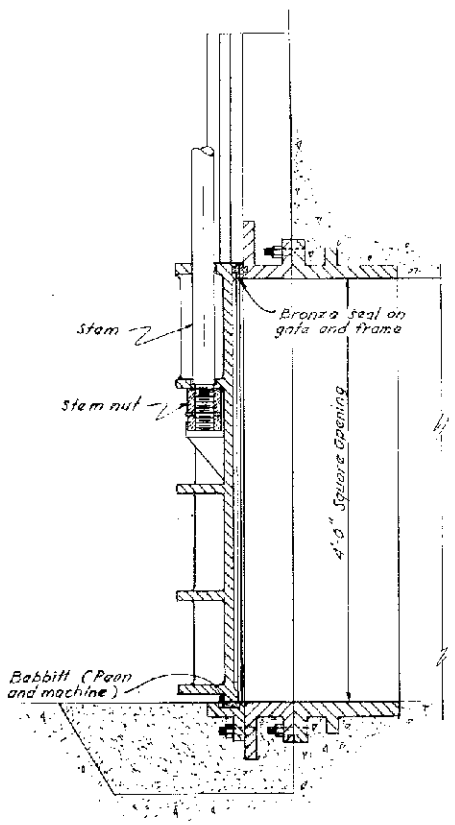
DES. BY F.J.G. | DR. BY J.P.V. | CH. BY
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
MECHANICAL
PLANS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVED — DATE MARCH 1962
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-018-62-49
DRAWING NUMBER
CT-1-5791
SHEET 75

CORPS OF ENGINEERS — U. S. ARMY

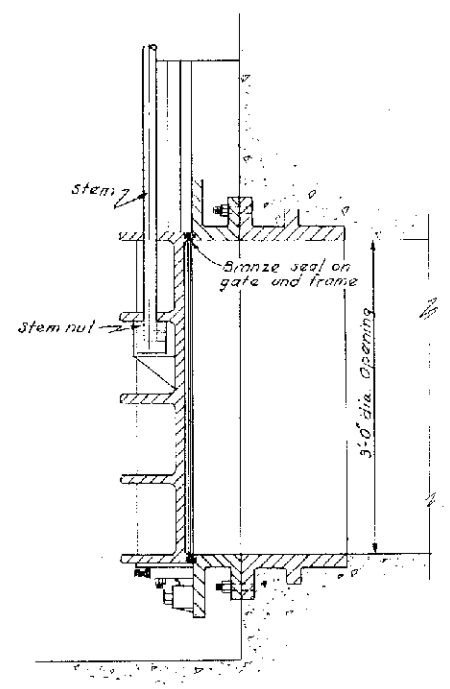


PLAN — 48" GATE

PLAN — 36" GATE

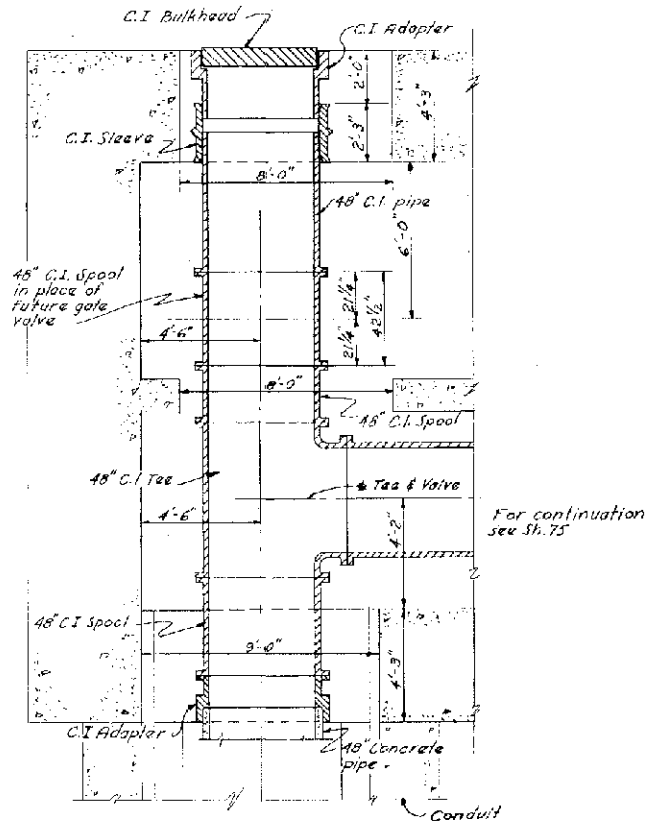


SECTION THRU 48" GATE
(12" Gate similar except for dimensions and circular opening)



SECTION THRU 36" GATE

GATE ASSEMBLY DETAILS
SCALE 1/2" = 1'-0"



PLAN

DETAIL - 48" C.I. PIPE AT EL. 431.0
SCALE 3/8" = 1'-0"

NOTES

All work, materials and equipment in connection with the heating system, as specified, will be paid for under Item No. 63.

All work, materials and equipment in connection with the gates, valves and accessories, as specified, will be paid for under Item No. 64.

All work, materials and equipment in connection with the traveling crane, as specified, will be paid for under Item No. 65.

All work, materials and equipment in connection with the 48" water supply piping as specified, will be paid for under Item No. 65.

GRAPHIC SCALES

1 1/2" = 1'-0"

3/8" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

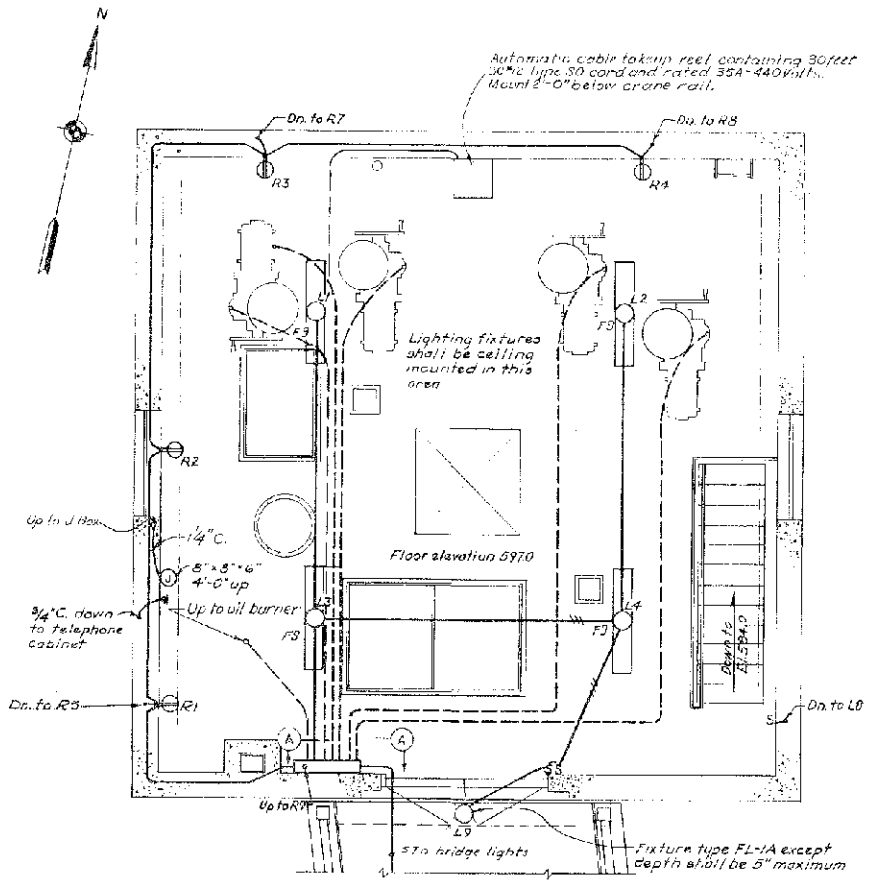
DES. BY F.J.S. | DR. BY J.R.V. | CH. BY F.J.S.

SUBMITTED: Fred J. Sawtelle, CHIEF, DESIGN SECTION
PROJECT ENGINEER
MECHANICAL RECOMMENDED: CHIEF, DESIGN BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION

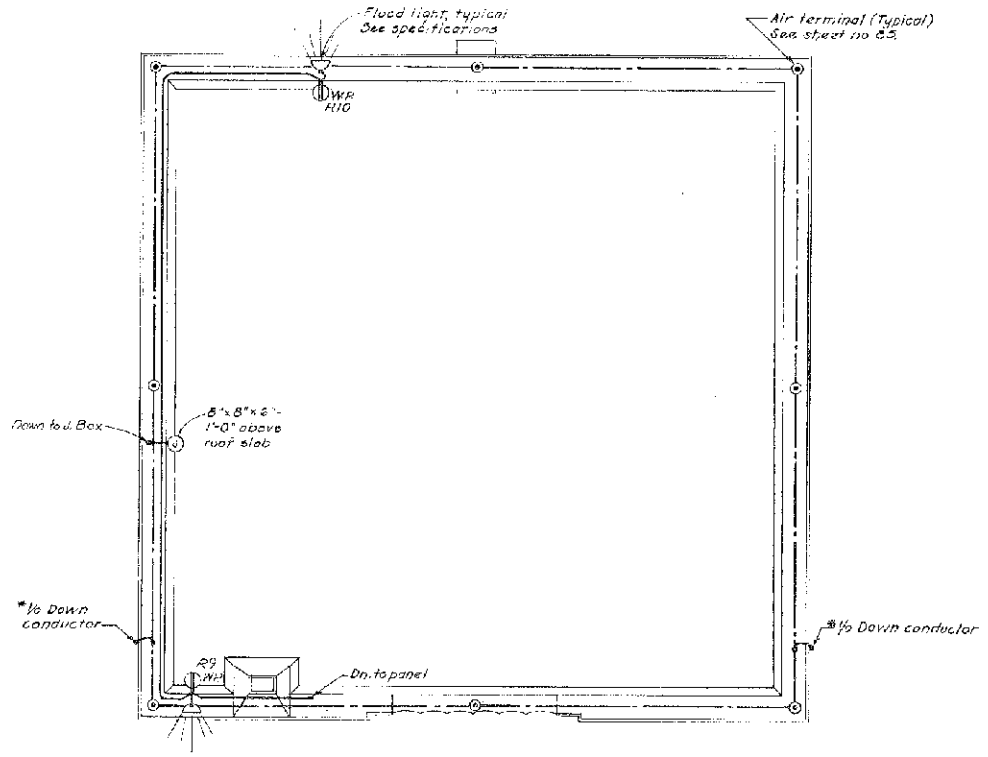
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
MECHANICAL
GATE ASSEMBLIES & MISCELLANEOUS DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVED: DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-018-62-49
DRAWING NUMBER
CT-1-5782
SHEET 74

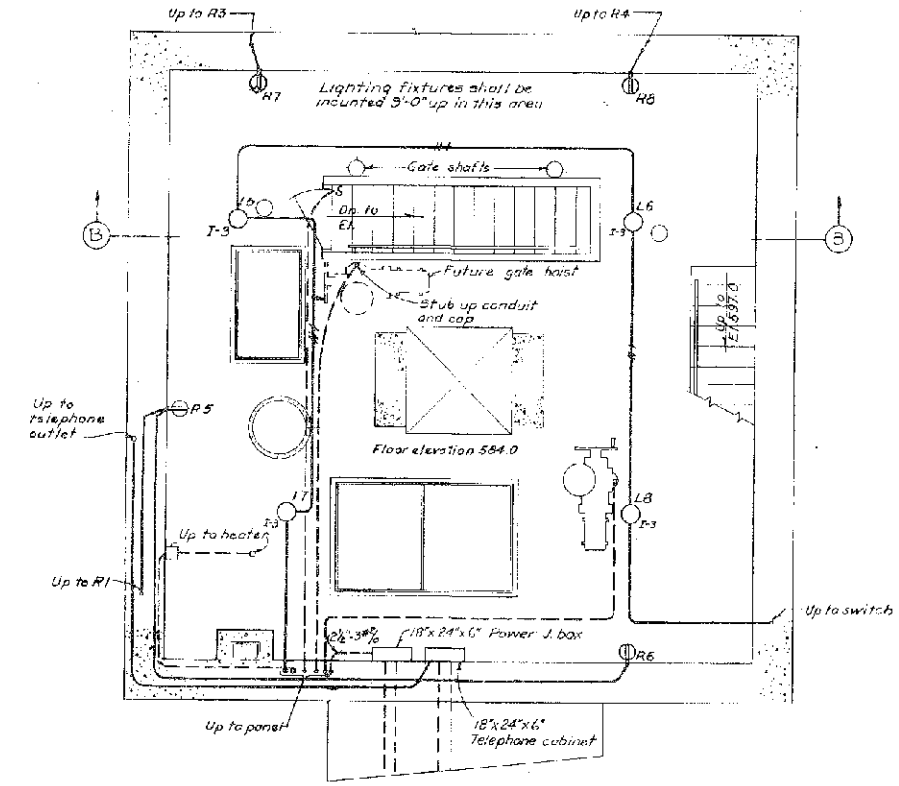
CORPS OF ENGINEERS — U.S. ARMY



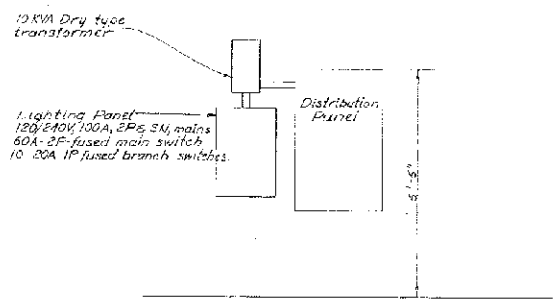
OPERATING FLOOR PLAN
SCALE 3/8" = 1'-0"



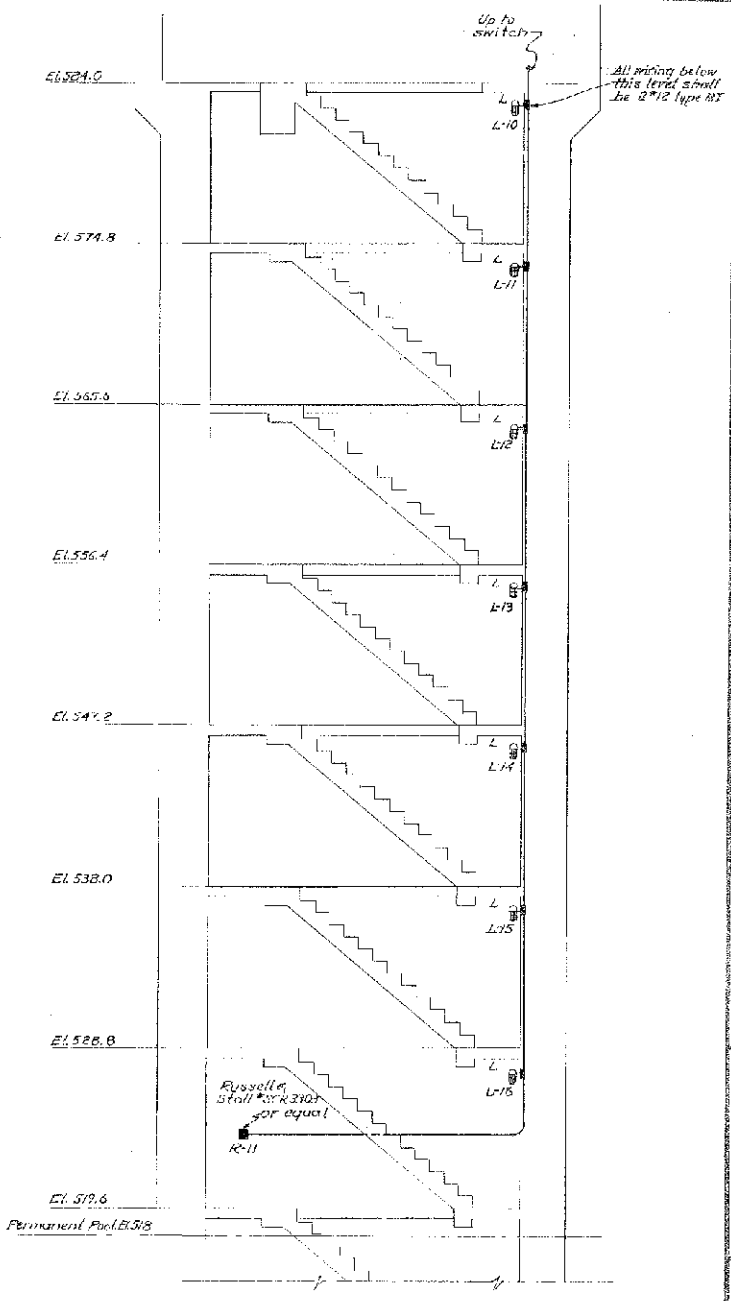
ROOF PLAN
SCALE 3/8" = 1'-0"



HEATER FLOOR PLAN
SCALE 3/8" = 1'-0"



ELEVATION A - A
SCALE 1/2" = 1'-0"



SECTION B-B
SCALE 1/4" = 1'-0"

NOTE
Electrical work in the water supply intake tower will be paid for under Item 86.

GRAPHIC SCALES
3/8" = 1'-0"
1/2" = 1'-0"
1/4" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.J.O. | DR. BY C.R.S. & E.N. | CK. BY H.C.

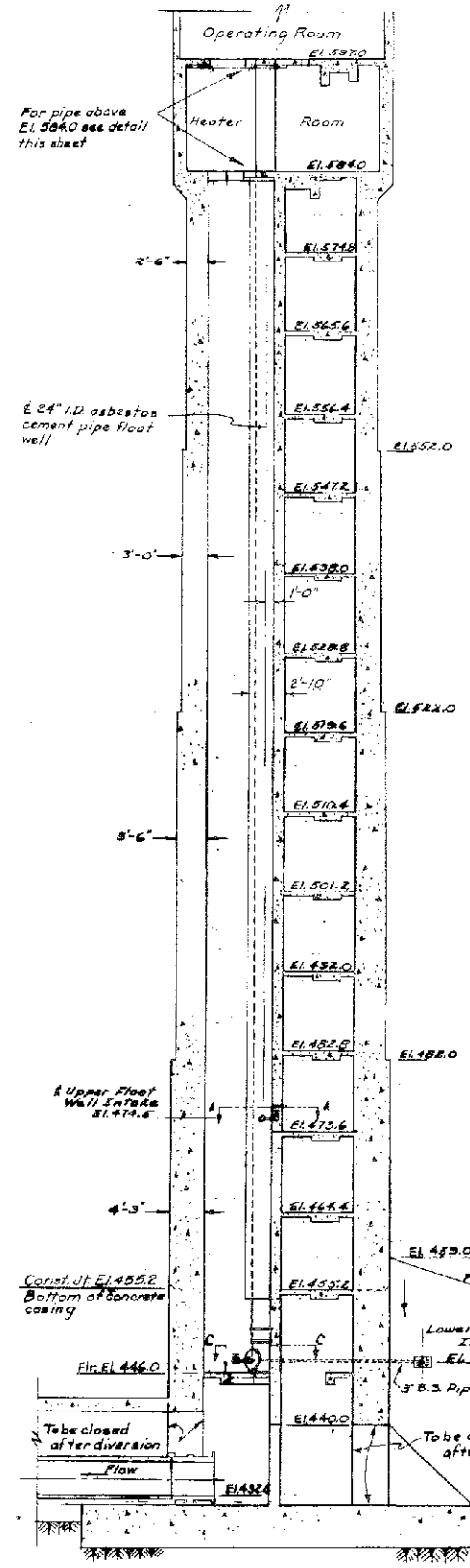
SUBMITTED: Chief, Engineering Division
APPROVAL RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Engineering Division
DATE: MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
ELECTRICAL
PLANS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

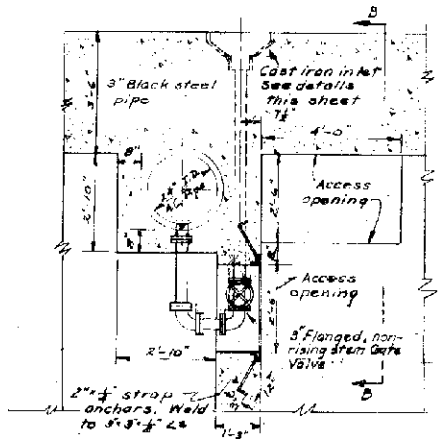
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-015-62-19
DRAWING NUMBER
CT-1-5783
SHEET 77

MODERN BLUE PRINT CO., BOSTON, MASS.

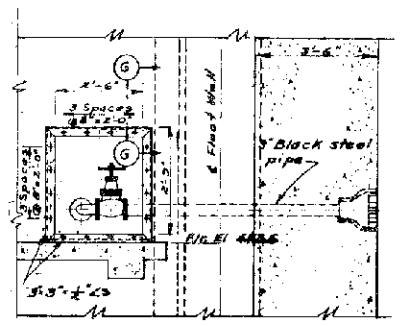
CORPS OF ENGINEERS — U. S. ARMY



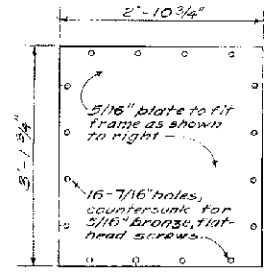
SECTION ON ℄ WATER SUPPLY CONDUIT
SCALE: 1/8"=1'-0"



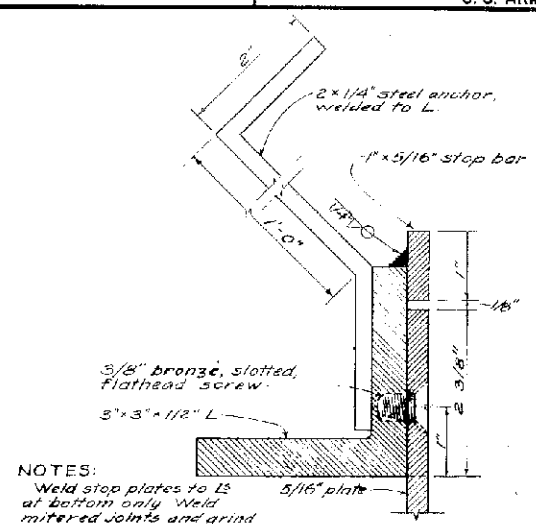
SECTION A-A



SECTION B-B



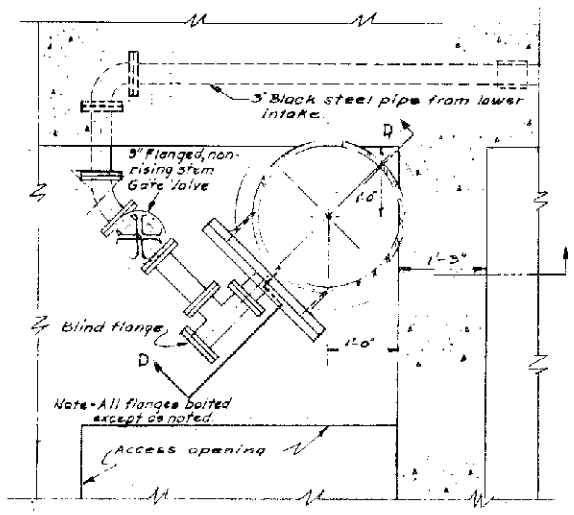
COVER
UPPER INTAKE ACCESS OPENING
SCALE: 1"= 1'-0"



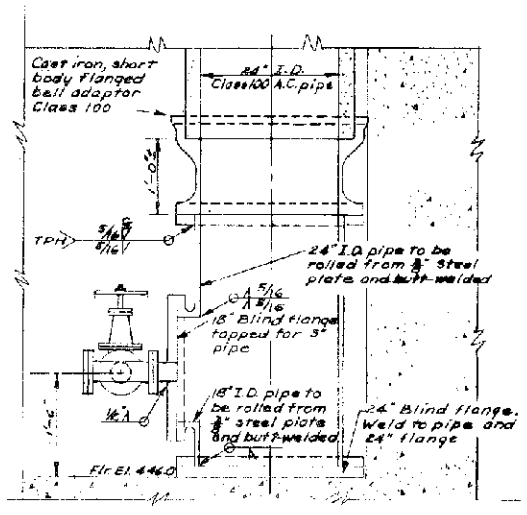
NOTES:
Weld stop plates to Ls at bottom only. Weld mitered joints and grind top surfaces smooth for frame.

SECTION G-G
FULL SCALE

UPPER FLOAT WELL INTAKE
SCALE: 1/2"=1'-0"

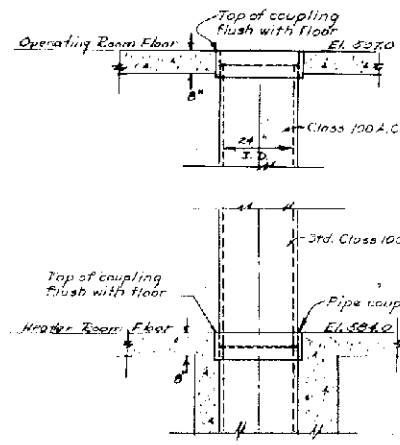


SECTION C-C



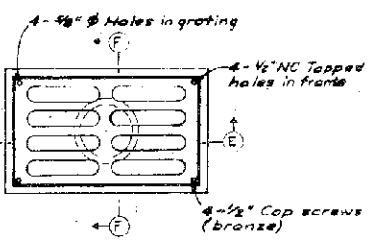
SECTION D-D

ACCESS CHAMBER DETAILS
SCALE: 1"=1'-0"

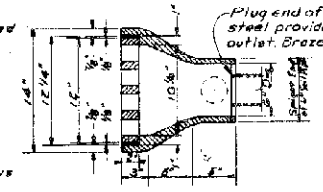


FLOAT WELL DETAIL
BETWEEN EL. 584.0 & EL. 597.0
SCALE: 1/2"=1'-0"

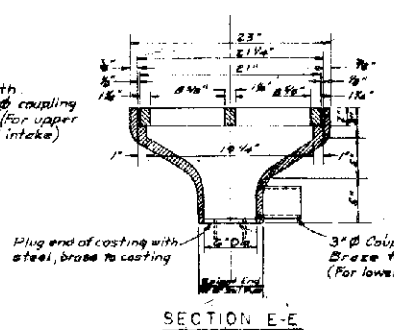
NOTES-
All elevations refer to Mean Sea level Datum.
Float Well and accessories will be paid for under Item No. 70.
For location and details of float well cabinet see Sheet No. 63.



PLAN



SECTION F-F



SECTION E-E

FLOAT WELL INTAKE DETAILS
SCALE: 1 1/2"=1'-0"

GRAPHIC SCALES
1/8"= 1'-0"
1/4"=1'-0"
1/2"=1'-0"
1"=1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY T.J.B. | DR. BY R.H.W. | CK. BY P.B.

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, E & C BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
FLOAT WELL AND ACCESSORIES
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

DATE MARCH 1962

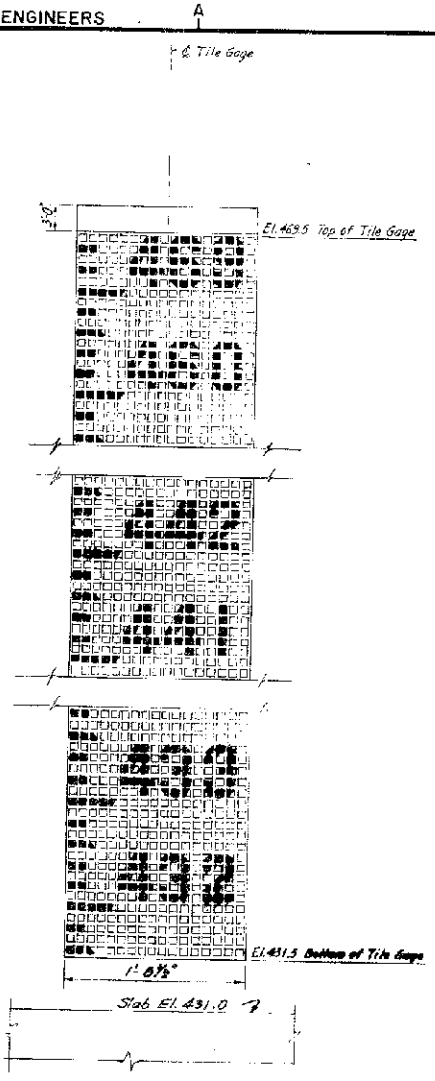
SCALE AS SHOWN | SPEC. NO. CIV ENG. 19-015-62-49

DRAWING NUMBER
CT-1-5784

SHEET 78

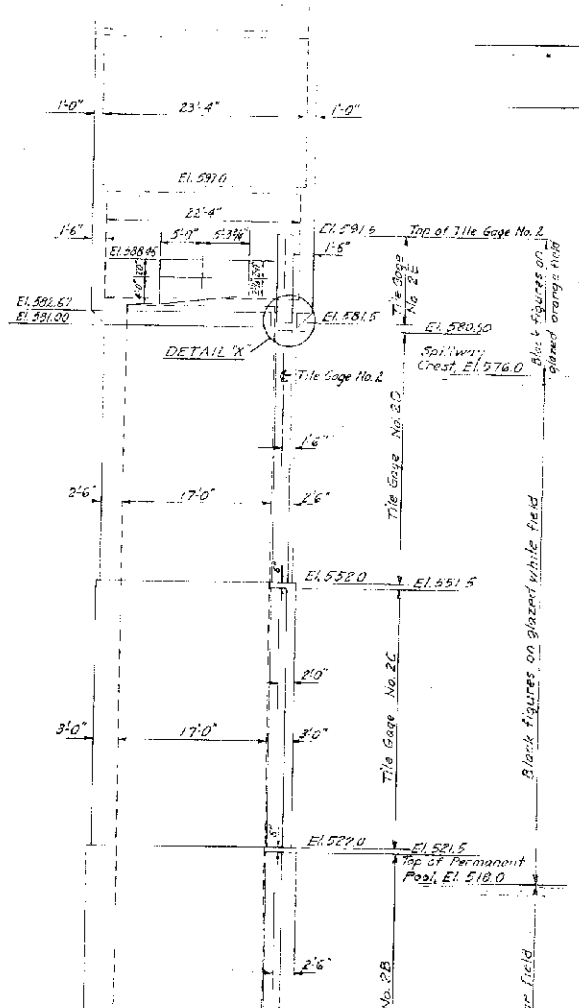
CORPS OF ENGINEERS

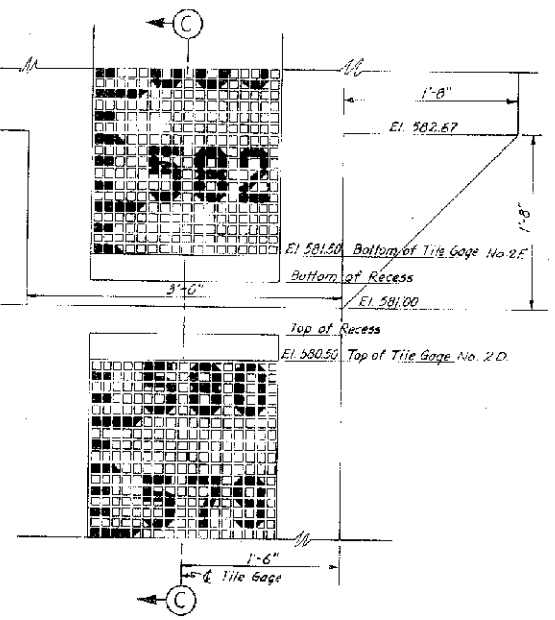
U.S. ARMY



TILE GAGE NO. 1

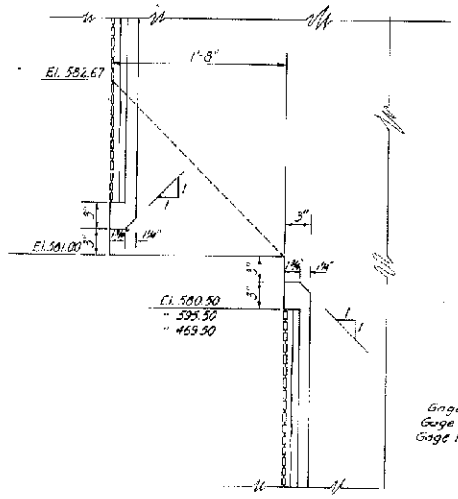
SCALE: 1-1/2" = 1'-0"





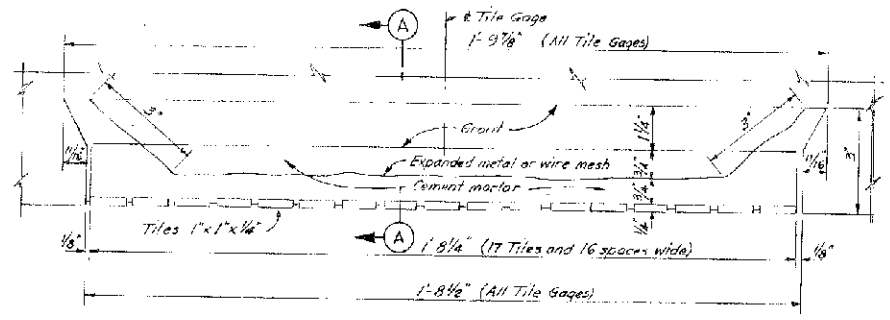
DETAIL "X"

SCALE: 1-1/2" = 1'-0"



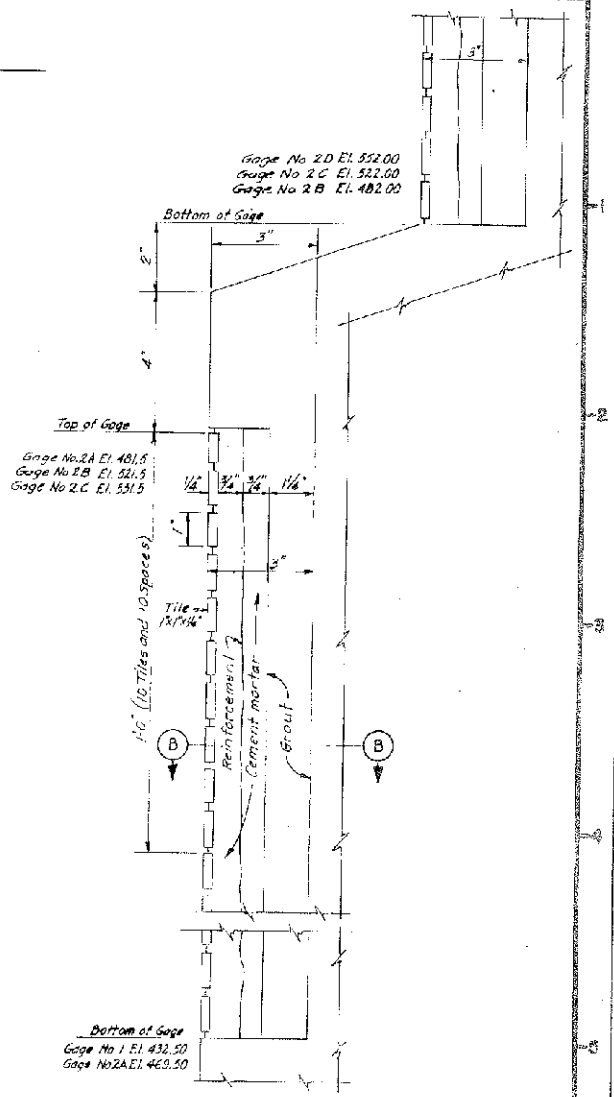
SECTION C-C

SCALE: 1-1/2" = 1'-0"



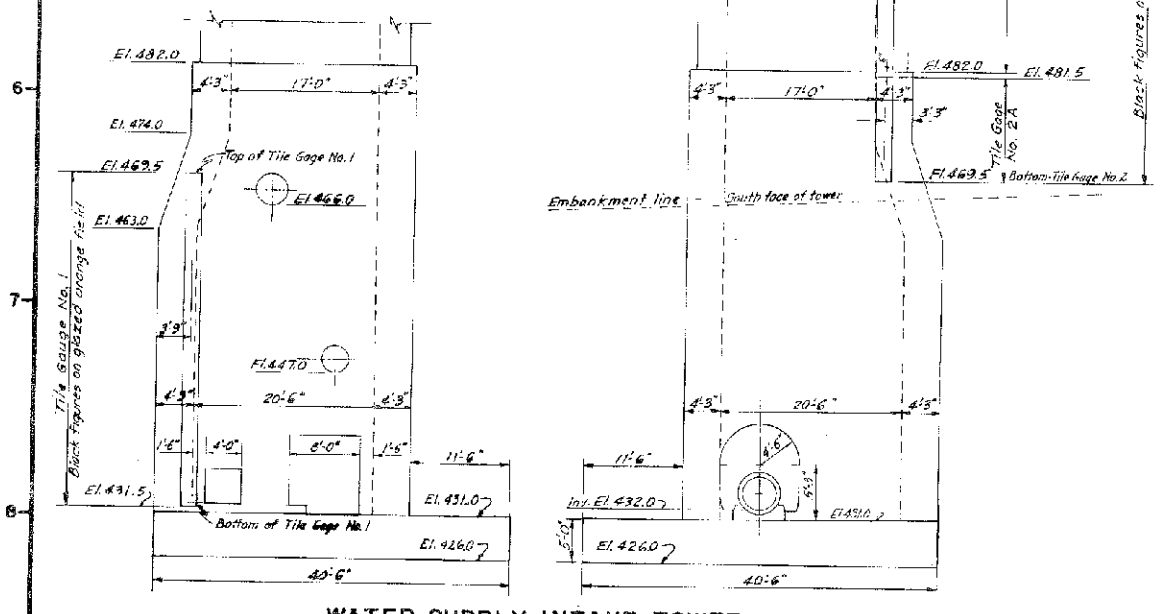
SECTION B-B

SCALE: 6" = 1'-0



SECTION A-A

SCALE: 6" = 1'-0"



WATER SUPPLY INTAKE TOWER

ELEVATION NORTH SIDE

SCALE: 1/8" = 1'-0"

ELEVATION-SOUTH SIDE

SCALE: 1/8" = 1'-0"

NOTES:

Elevations refer to Mean Sea Level Datum.

Tile gages will be paid for under Item No. 72.

GRAPHIC SCALES

1/8" = 1'-0"

1-1/2" = 1'-0"

6" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B.	DR. BY C.T.M.	CK. BY R.W.

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, E & D BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY INTAKE TOWER
TILE GAGES
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

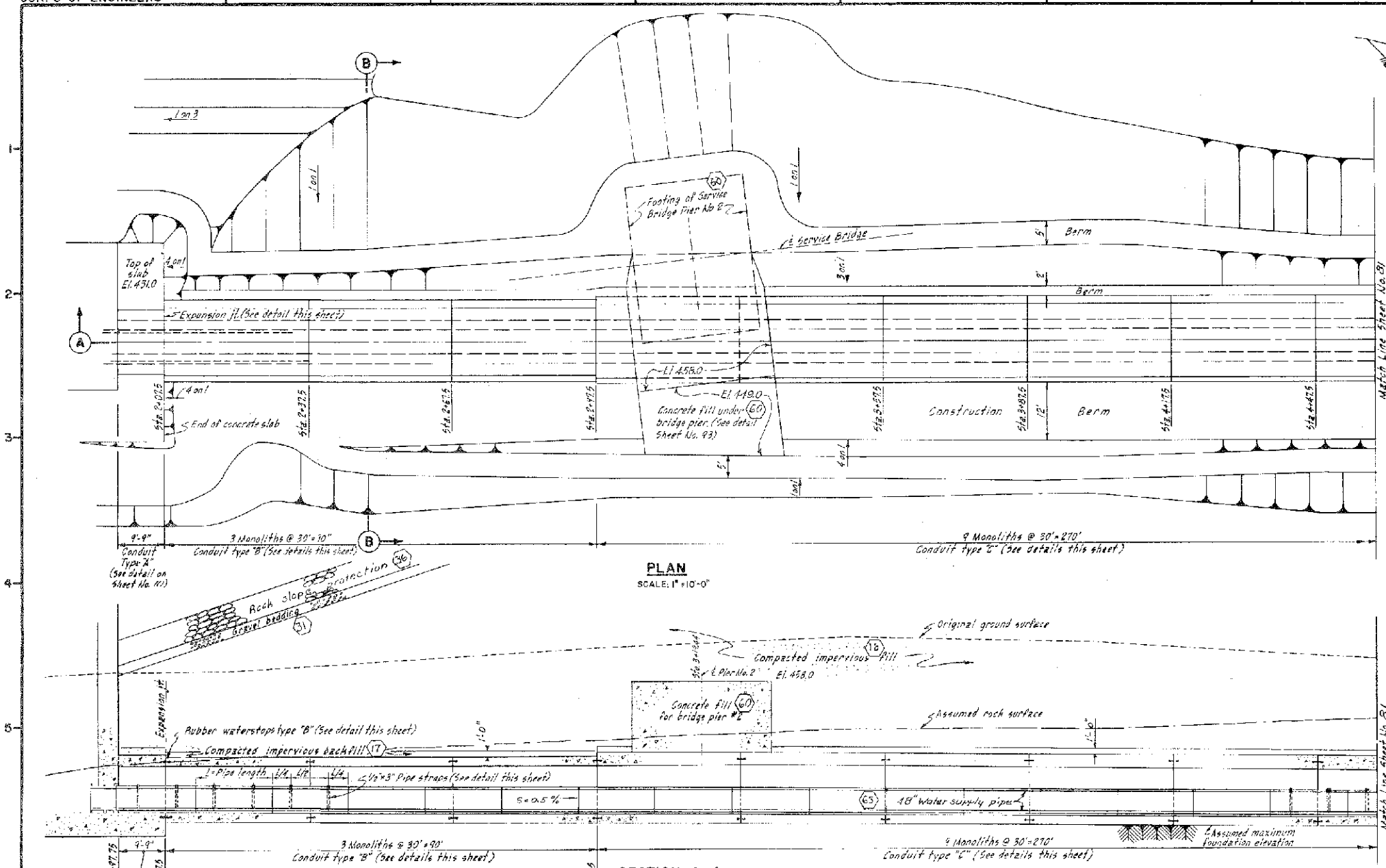
SCALE AS SHOWN

SPEC. NO. CIV. ENG. 18-016-62-69

DRAWING NUMBER
CT-1-5785

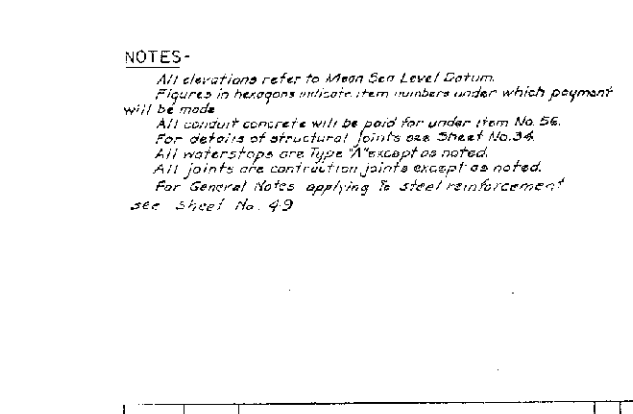
SHEET 79

CORPS OF ENGINEERS — U.S. ARMY

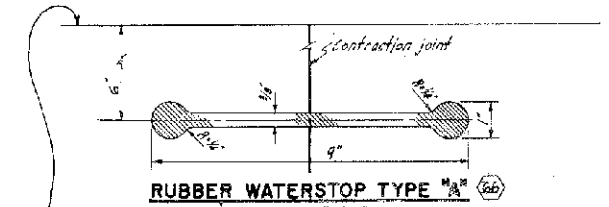


PLAN
SCALE: 1" = 10'-0"

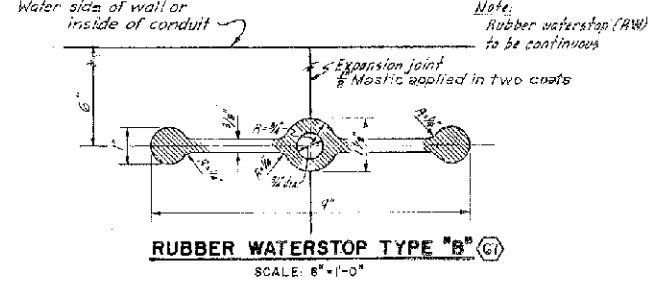
SECTION A-A
SCALE: 1" = 10'-0"



SECTION B-B
SCALE: 1" = 10'-0"

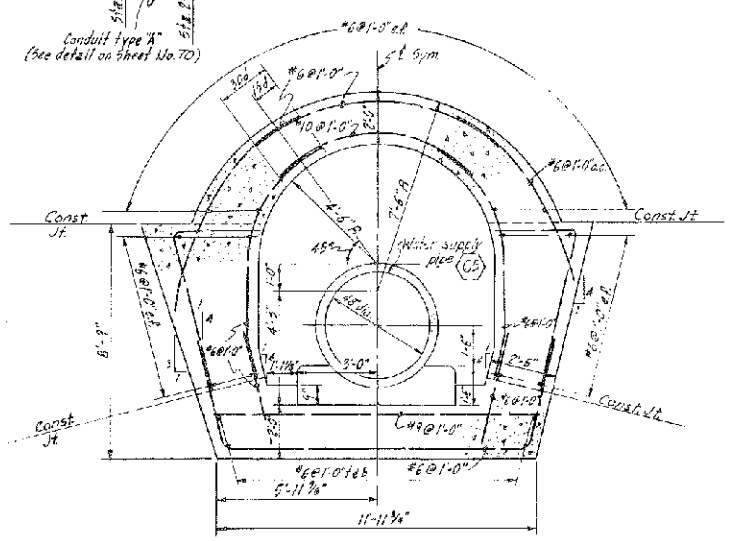


RUBBER WATERSTOP TYPE "A"
SCALE: 6" = 1'-0"

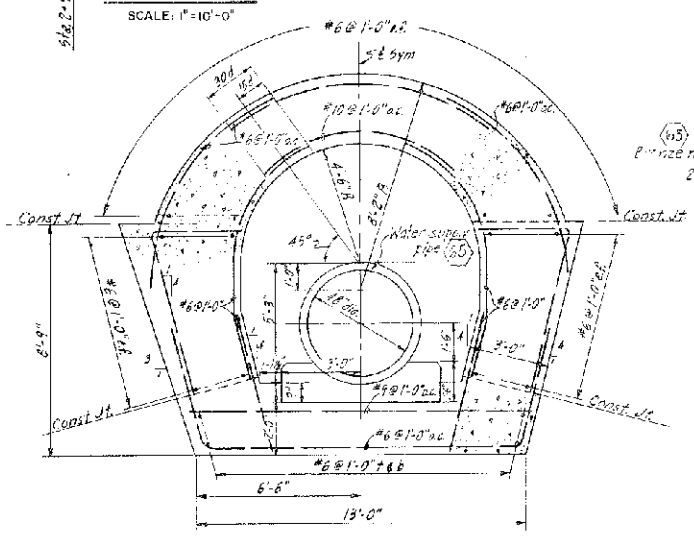


RUBBER WATERSTOP TYPE "B"
SCALE: 6" = 1'-0"

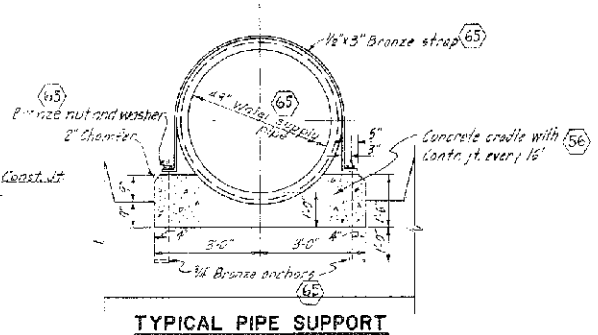
NOTES-
All elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate item numbers under which payment will be made.
All conduit concrete will be paid for under item No. 56.
For details of structural joints see Sheet No. 34
All waterstops are Type "A" except as noted.
All joints are contruction joints except as noted.
For General Notes applying to steel reinforcement see Sheet No. 49



CONDUIT SECTION TYPE "B"
SCALE: 3/8" = 1'-0"
(Looking Downstream)



CONDUIT SECTION TYPE "C"
SCALE: 3/8" = 1'-0"
(Looking Downstream)



TYPICAL PIPE SUPPORT
SCALE: 1/2" = 1'-0"

GRAPHIC SCALES
3/8" = 1'-0"
1/2" = 1'-0"
1" = 1'-0"
6" = 1'-0"
1" = 10'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CH. BY
L.J.B.	R.J.C.	P.H.

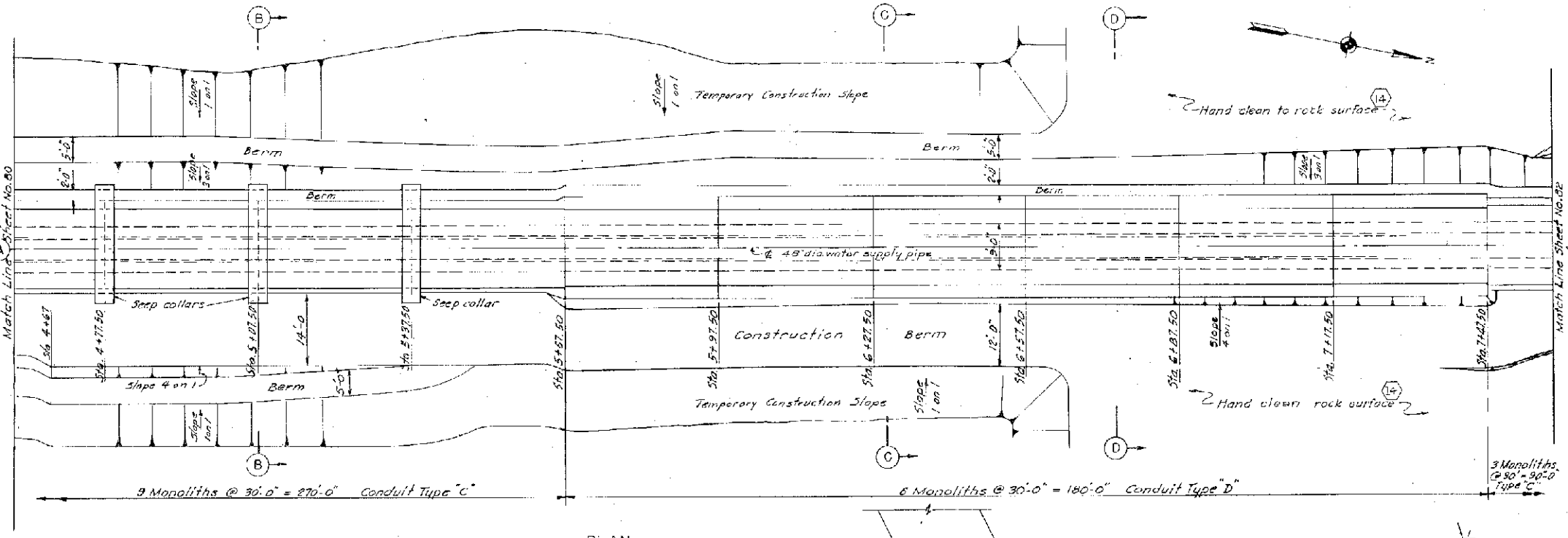
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY CONDUIT
PLAN AND SECTIONS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

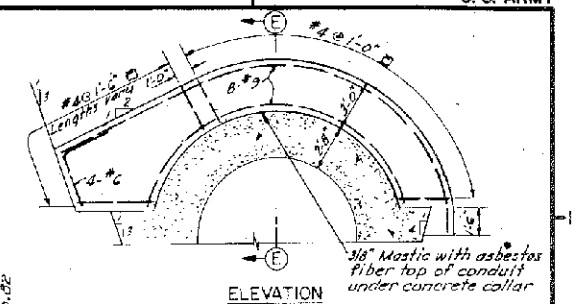
APPROVED — DATE MARCH 1962
CHIEF, ENGINEERING DIVISION

SCALE: AS SHOWN | SPEC. NO. CIV. ENG. 19-019-62-43
DRAWING NUMBER
CT-1-5786
SHEET 60

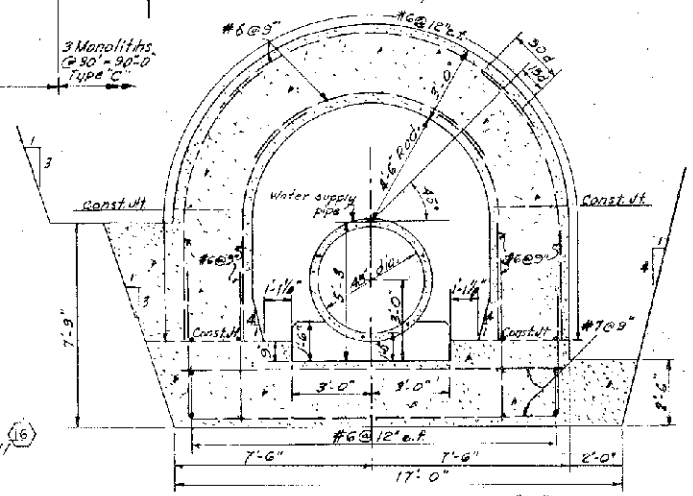
CORPS OF ENGINEERS — U. S. ARMY



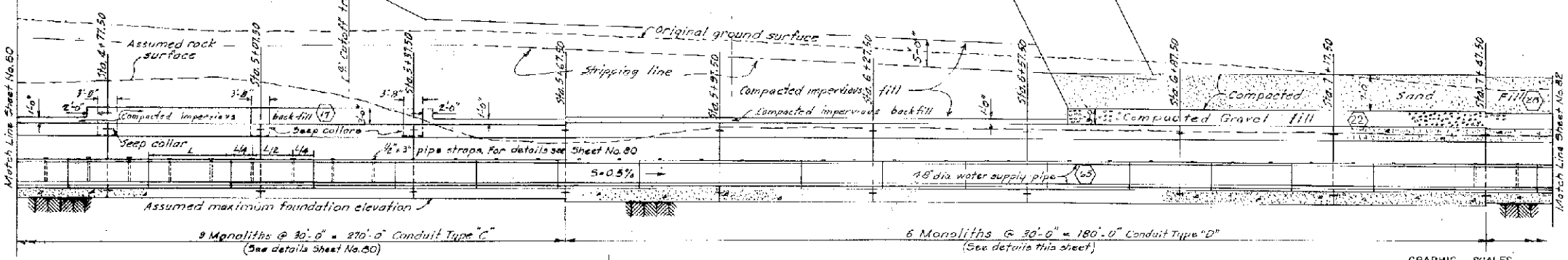
PLAN
SCALE 1"=10'-0"



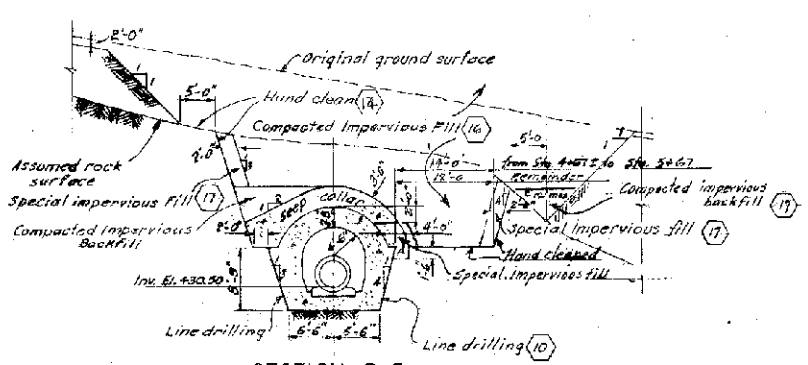
SEEP COLLAR DETAIL
SCALE: 1/4"=1'-0"



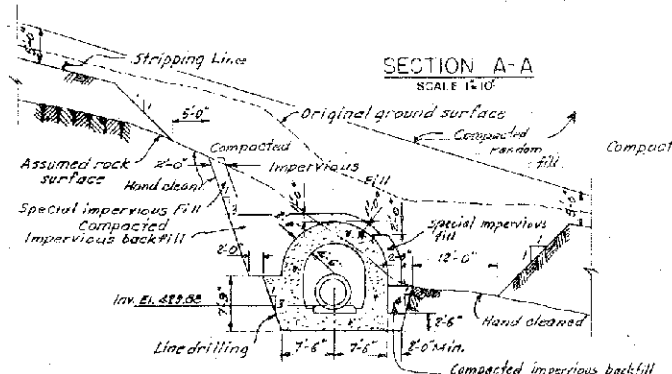
CONDUIT SECTION TYPE "D"
SCALE 3/8"=1'-0"
(Looking downstream)



NOTES -
1. For General Notes see Sheet No.80.
2. Special impervious fill to be placed on rock excavation slopes above the backfill between stations 4+60 and station 6+65.
3. Initial layer of gravel fill over conduit shall be 12 inches.
4. For General Notes applying to steel reinforcement see Sheet No. 49.

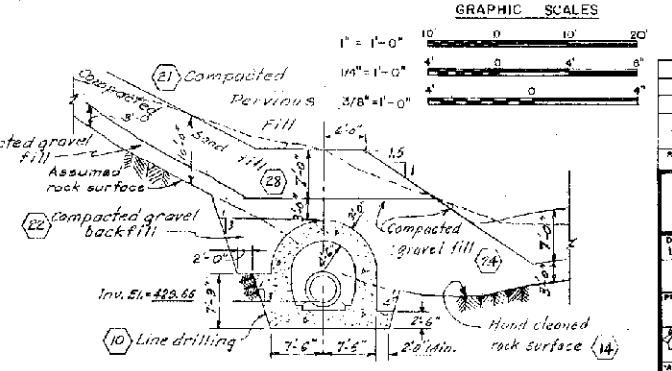


SECTION B-B
STA. 5+07.5



SECTION A-A
SCALE 1"=10'

SECTION C-C
STA. 6+30



SECTION D-D
STA. 6+75

TYPICAL SECTIONS
SCALE 1"=10'

GRAPHIC SCALES
1" = 1'-0"
1/4" = 1'-0"
3/8" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
L.J.B.	J.A.M.	T.W.

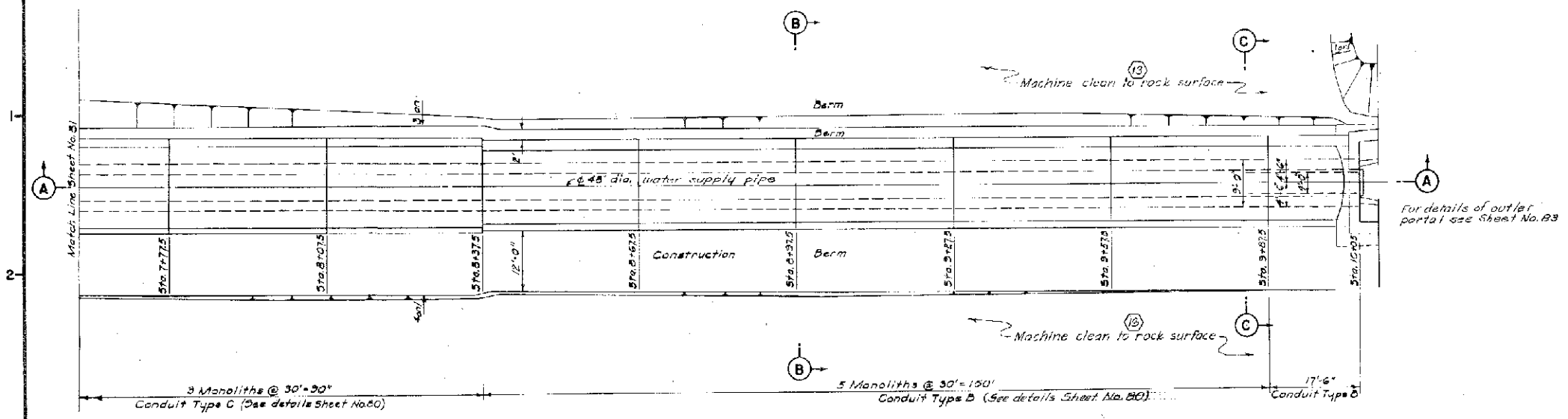
PROJECT ENGINEER
APPROVED RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVED RECOMMENDED
CHIEF, E & R BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY CONDUIT
PLAN AND SECTIONS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

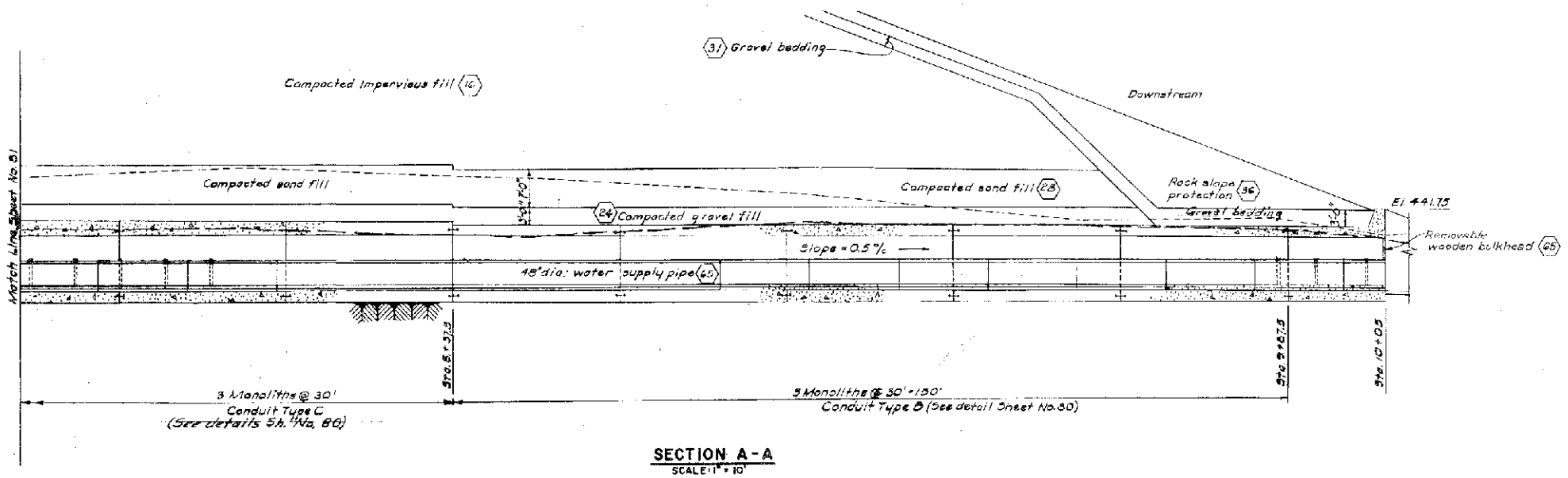
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN | APPR. NO. DIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-I-5787
SHEET 81

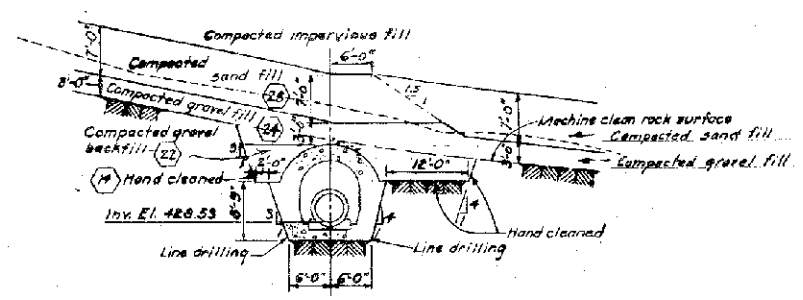
CORPS OF ENGINEERS — U. S. ARMY



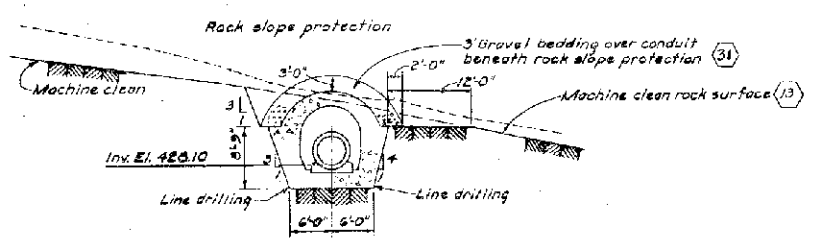
PLAN
SCALE: 1" = 10'



SECTION A-A
SCALE: 1" = 10'



SECTION B-B
STA. 9+00
SCALE: 1" = 10'



SECTION C-C
STA. 9+85
SCALE: 1" = 10'

GRAPHIC SCALE
1" = 10'

NOTES:
For General Notes see Sheet No. 80.
Initial layer of gravel fill over conduit shall be 12 inches

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.J.B. | DR. BY D.MAC. | CK. BY W.H.

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY CONDUIT
PLAN AND SECTIONS NO. 3
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

PROJECT ENGINEER

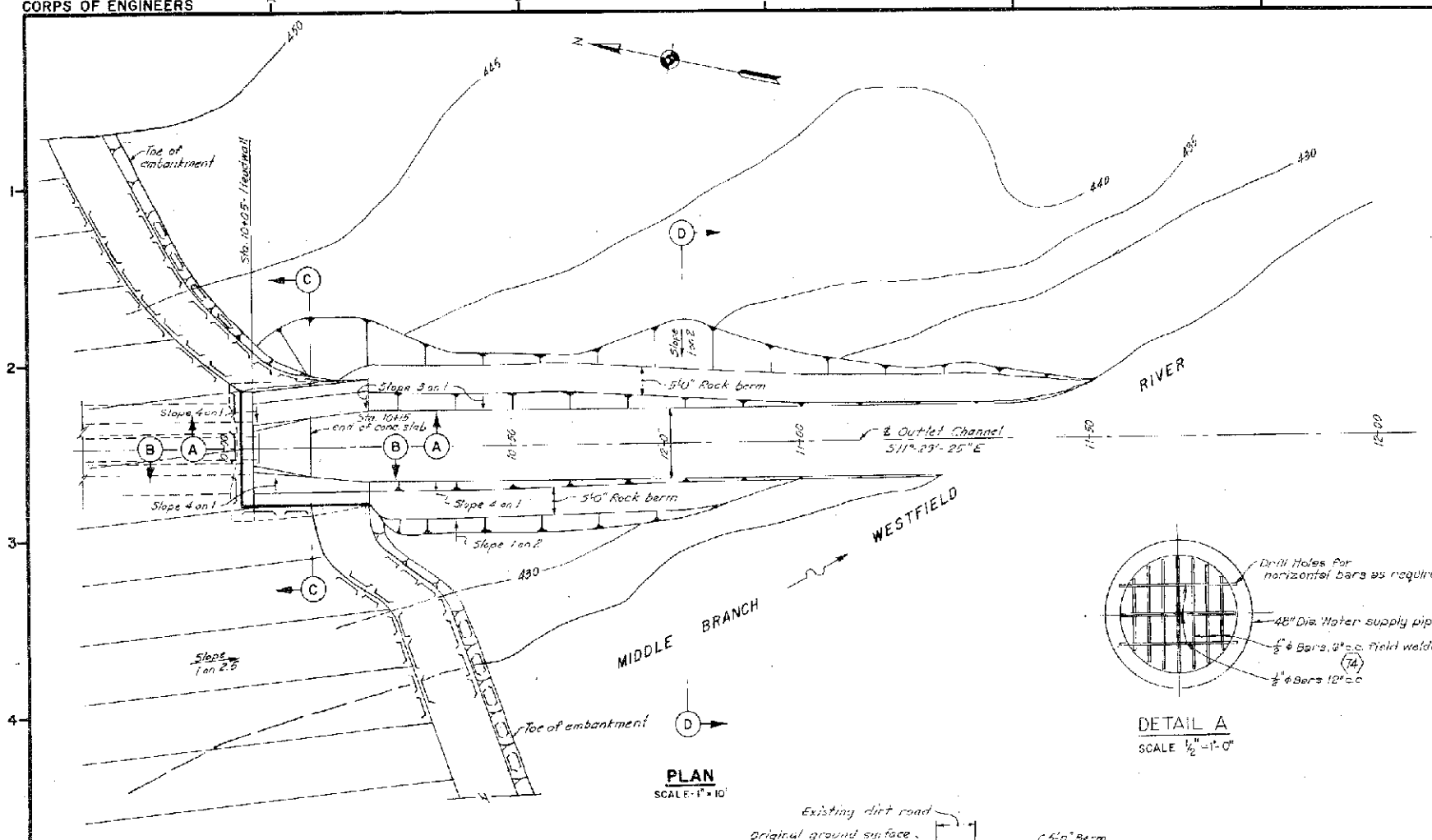
APPROVED — DATE MARCH 1962

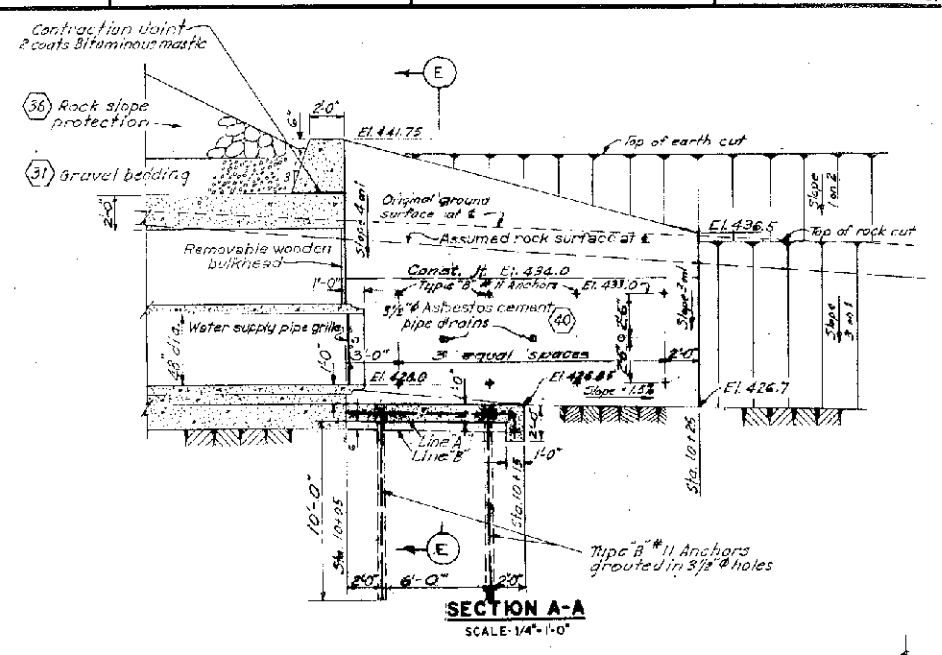
SCALE: 1" = 10' | SPEC. NO. CW. ENG. 19-016-62-49

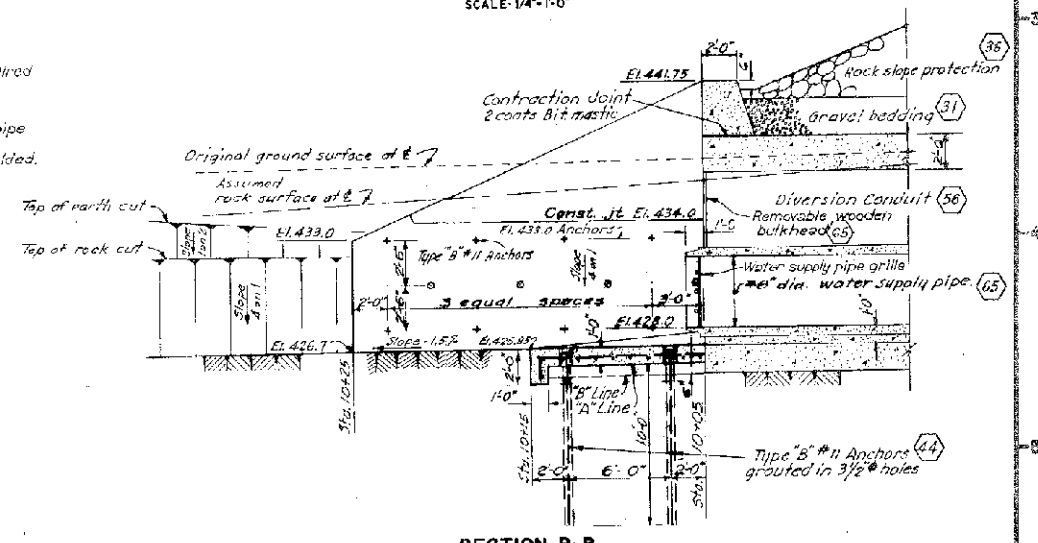
DRAWING NUMBER
CT-1-5788

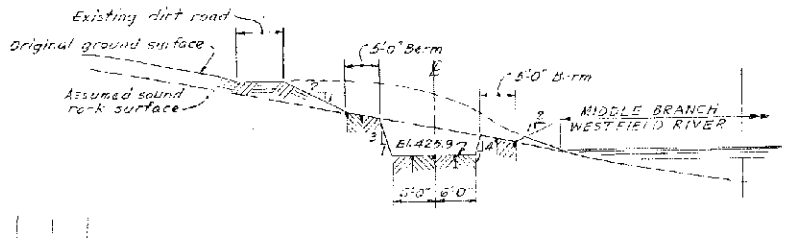
SHEET 82

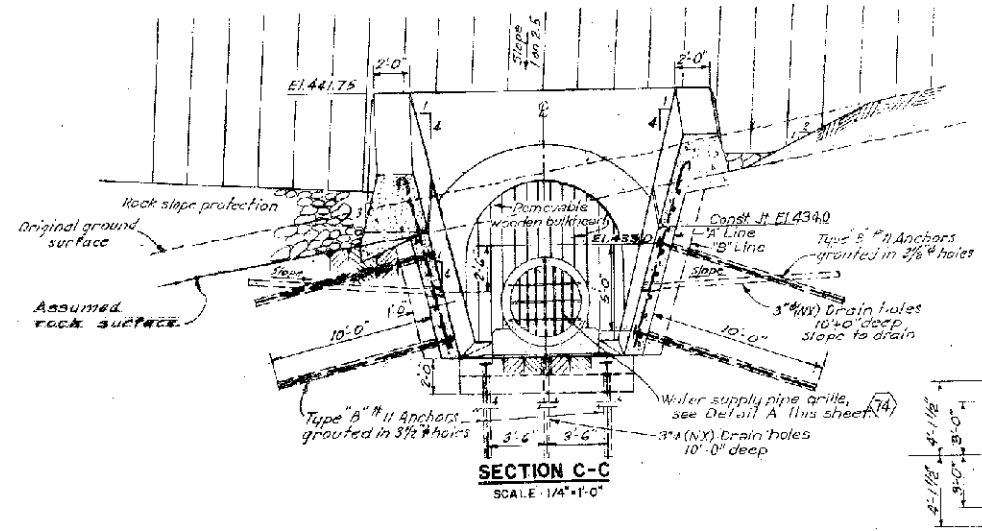
CORPS OF ENGINEERS — U. S. ARMY

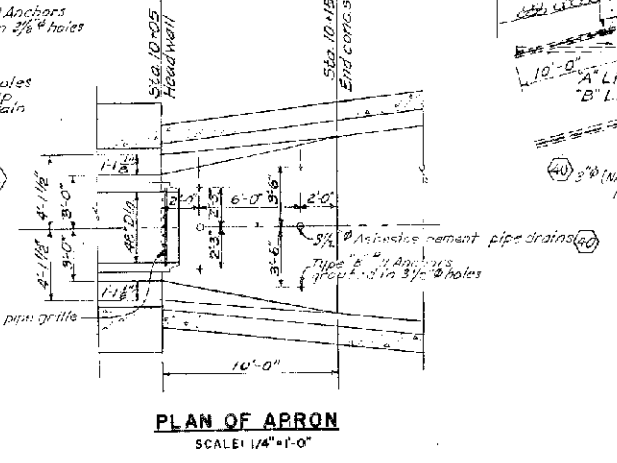


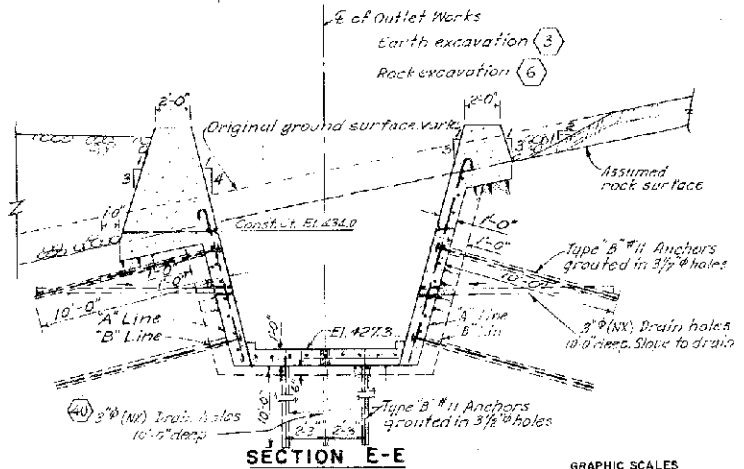












GRAPHIC SCALES
1" = 10'
1/4" = 1'-0"
1/2" = 1'-0"

NOTES

For details of Type "B" Anchors, see Sheet No. 34 & 42.
Line "A" indicates minimum thickness of concrete.
Line "B" indicates payment line for rock excavation and concrete.
For structural joint details see Sheet No. 34.
All channel lining to be reinforced with "B" rods sp. 1'-6" c.c. B.W.
Figures in hexagons indicate item numbers under which payment will be made.
All concrete in retaining walls will be paid for under Item No. 55.
All concrete in linings will be paid for under Item No. 56.A
All steel reinforcement will be paid for under Item No. 64.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

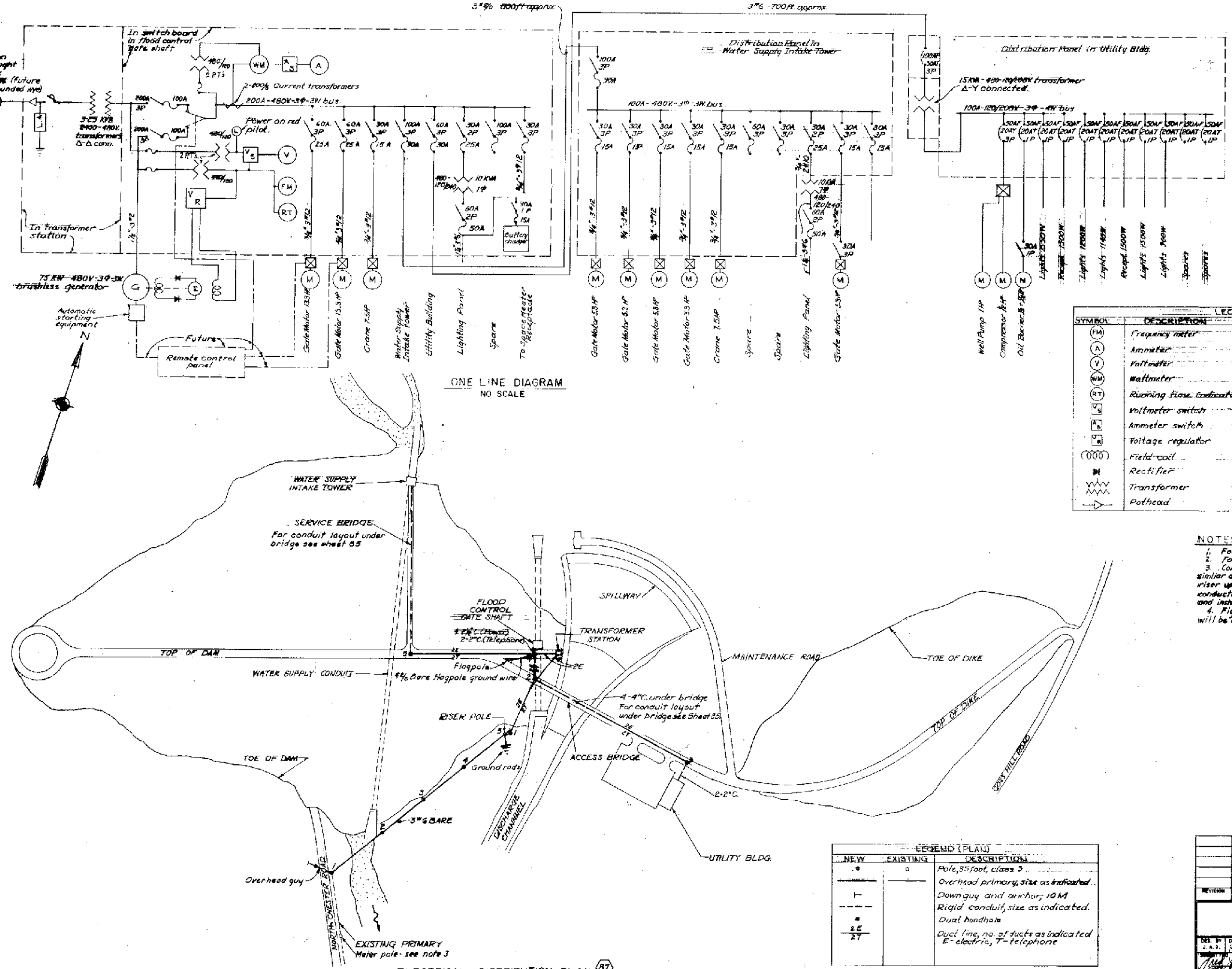
DES. BY L.J.B. | DR. BY K.H.W. | CK. BY P.V.E.

PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVAL RECOMMENDED
CHIEF, OPERATIONS DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY OUTLET PORTAL
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVED — DATE MARCH 1962
DIVISION ENGINEER

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5789
SHEET 83

CORPS OF ENGINEERS — U. S. ARMY



ONE LINE DIAGRAM
NO SCALE

ELECTRICAL DISTRIBUTION PLAN (87)
SCALE 1" = 100'

LEGEND (ONE LINE DIAGRAM)

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
(FM)	Frequency meter		Circuit breaker, No. of poles, Trip and Frame Size as indicated.
(A)	Ammeter		Fused switch, No. of poles, switch size, and fuse as indicated.
(V)	Voltmeter		Fused cutout
(WM)	Watt meter	LA	Lightning arrestor
(RT)	Running time indicator	(G)	Generator
VS	Voltmeter switch	(E)	Exciter
AS	Ammeter switch	(M)	Motor
VR	Voltage regulator	(L)	Pilot light
(000)	Field coil		Magnetic motor starter
	Rectifier		Automatic transfer switch
	Transformer		Remote control circuits
	Pothead		

NOTES-
1. For transformer station and riser pole details see sheet 86.
2. For manhole details and duct sections see sheet 85.
3. Contractor shall install 24" high, 15" wide, 10" deep meter enclosure similar and equal to Anchor #24150, 4'-0" above grade, and a 4" conduit riser up pole, terminating in a 4 conductor weatherhead 8'-0" below primary conductors. Wiring, metering transformers, and meter will be furnished and installed by Utility company.
4. Figure in hexagon indicates Item No. under which payment will be made.

LEGEND (PLAN)

NEW	EXISTING	DESCRIPTION
●	○	Pole, 35 foot, class 5
———	———	Overhead primary, size as indicated
⊢		Down guy and anchor, 10 M
- - - -		Rigid conduit, size as indicated.
■		Dual handhole
2E / 2T		Duct line, no. of ducts as indicated E- electric, T- telephone

GRAPHIC SCALE
1" = 100'
100' 0 100' 200'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.A.D. | DR. BY R.A.B. | CK. BY P.L.

CHIEF, ELECT. SECTION

CHIEF, DESIGN BRANCH

CHIEF, ENGINEERING DIVISION

APPROVED

DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ELECTRICAL DISTRIBUTION SYSTEM
PLAN AND ONE LINE DIAGRAM
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

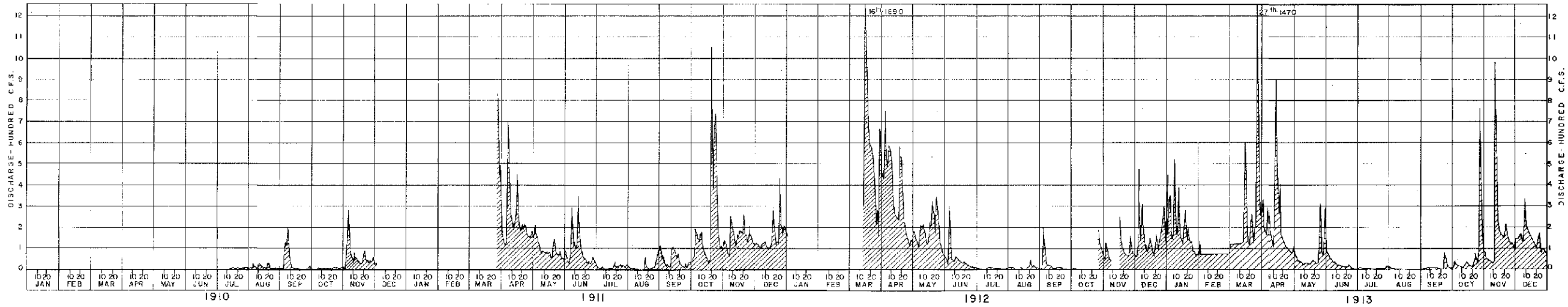
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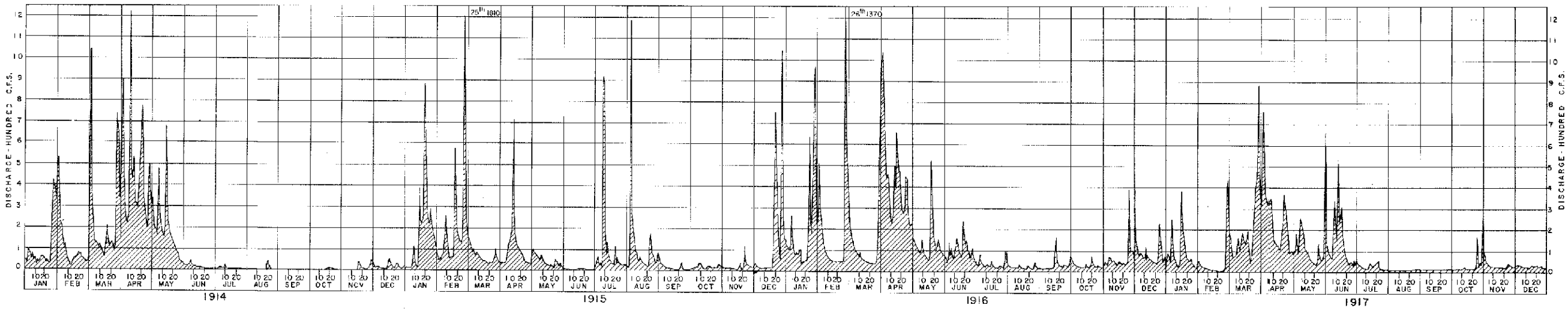
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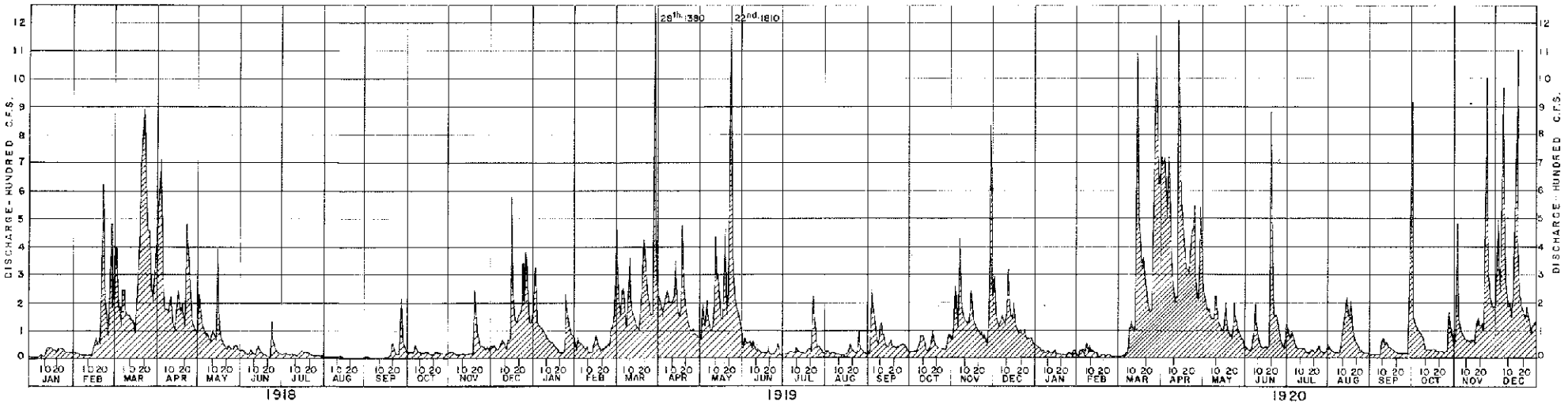
SHEET 84

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warranties but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY R.J.B. | TR. BY | CK. BY E.P.S.

SUBMITTED: CHIEF, HYD. & HYD. SECTION

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE RESERVOIR

HYDROGRAPHS NO. 1

MIDDLE BRANCH WESTFIELD RIVER, MASS.

APPROVED: CHIEF ENGINEERING DIVISION

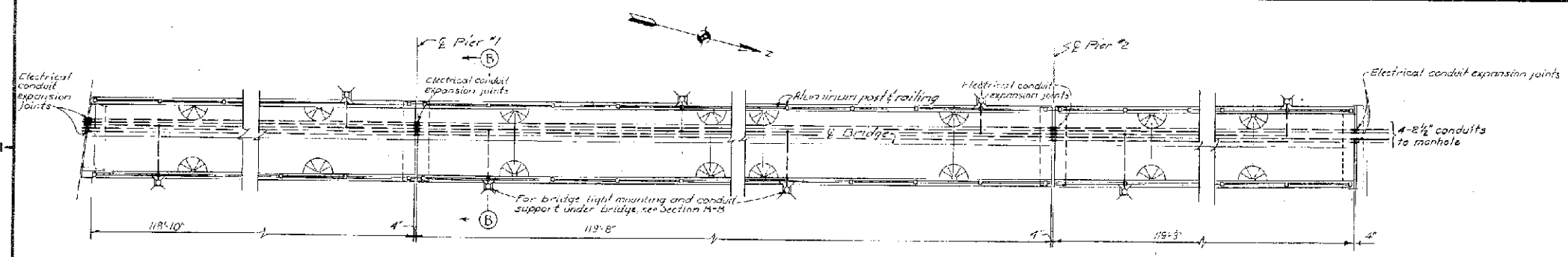
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SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-015-52-49

DRAWING NUMBER
CT-1-5726

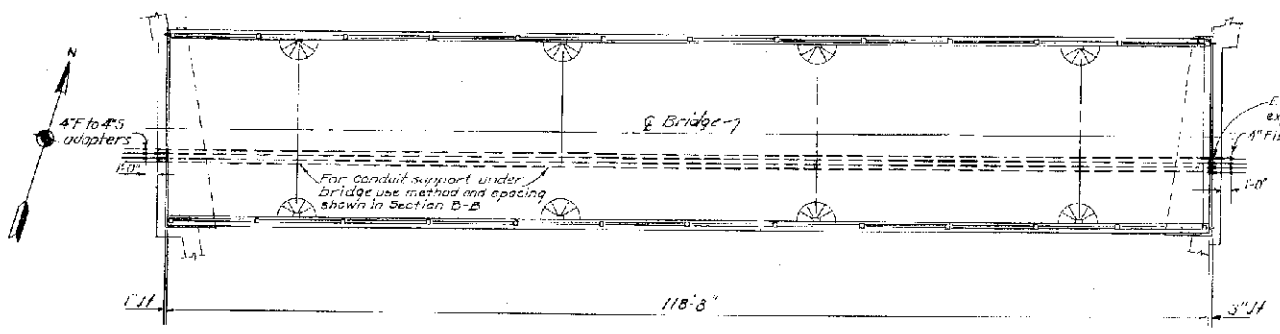
SHEET 3

CORPS OF ENGINEERS — U.S. ARMY



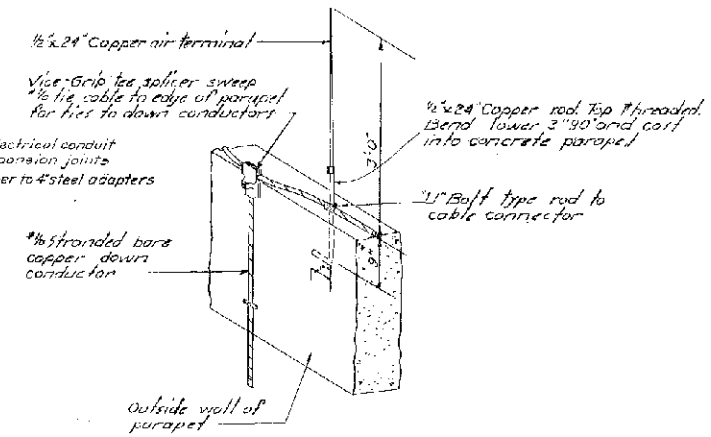
PLAN - SERVICE BRIDGE

SCALE 1/8"-1'-0"



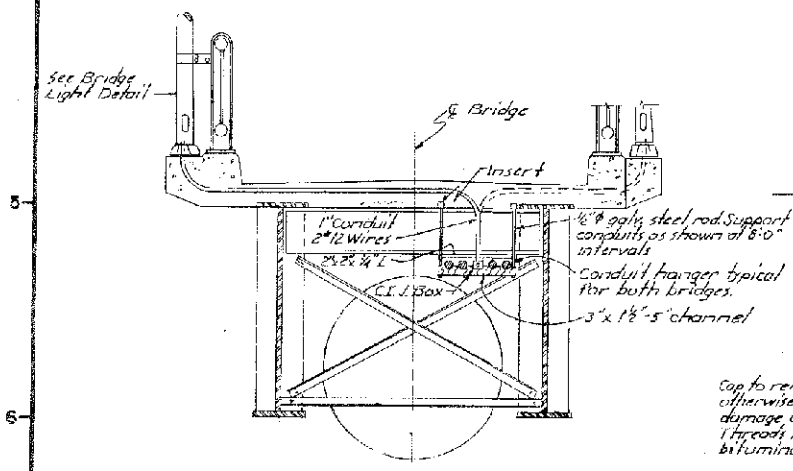
PLAN ACCESS BRIDGE

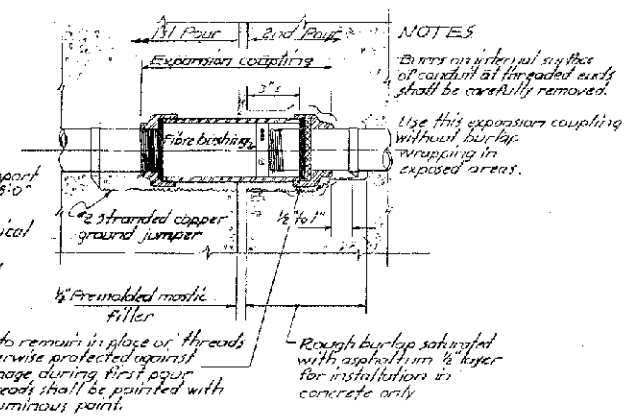
SCALE 1/8"-1'-0"



AIR TERMINAL MOUNTING DETAIL

NOT TO SCALE



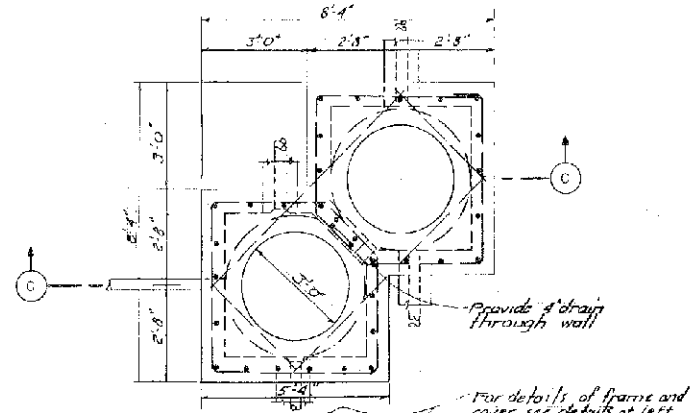


NOTES

Burrs on interior surface of conduit at threaded ends shall be carefully removed.

Use this expansion coupling without burlap wrapping in exposed areas.

DETAIL OF EXPANSION JOINT FITTING FOR ELECTRICAL CONDUITS



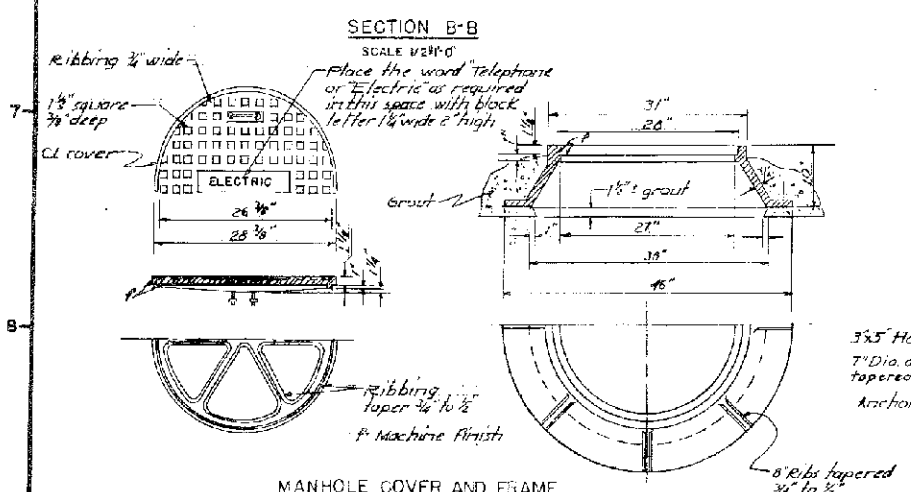
NOTES

Install end bells on all ducts entering manholes.

Install expansion coupling in each conduit crossing at each expansion joint in bridge.

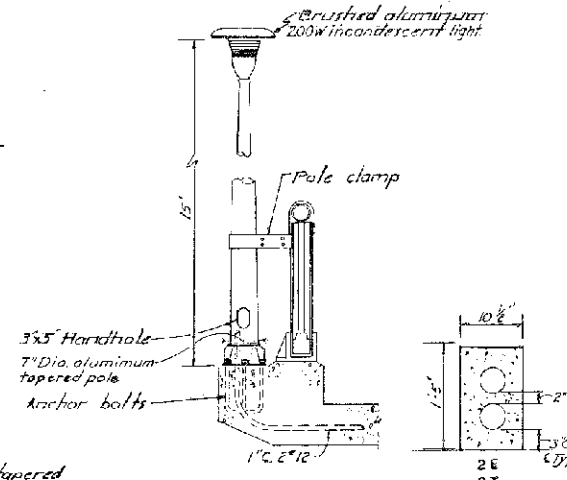
Manhole pipe drain shall conform to Section 38 of the Specifications.

4 Exterior electrical work shown on this sheet will be paid for under Item 87.



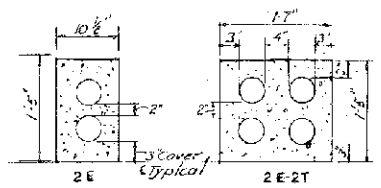
MANHOLE COVER AND FRAME

SCALE 1"=1'-0"



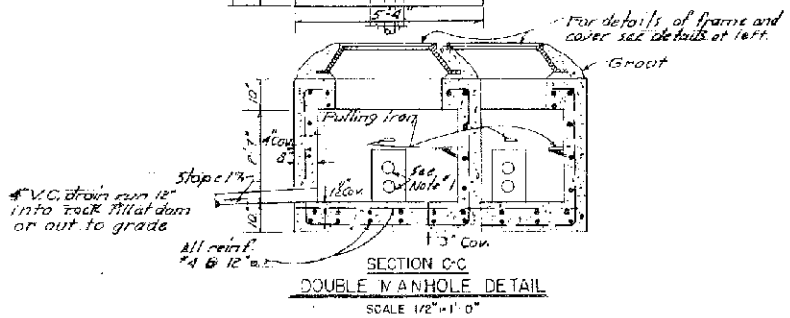
TYPICAL BRIDGE LIGHT DETAIL

SCALE 3/4"=1'-0"



TYPICAL DUCT SECTIONS

SCALE 1"=1'-0"



SECTION C-C

DOUBLE MANHOLE DETAIL

SCALE 1/2"=1'-0"

GRAPHIC SCALES

1/8" = 1'-0"
1/2" = 1'-0"
3/4" = 1'-0"
1" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.A.D. | DR. BY R.B.B. | CK. BY

SUBMITTED: Chief, Design Section
APPROVAL RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Engineering Division

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ELECTRICAL DISTRIBUTION SYSTEM
MISCELLANEOUS DETAILS NO. I
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

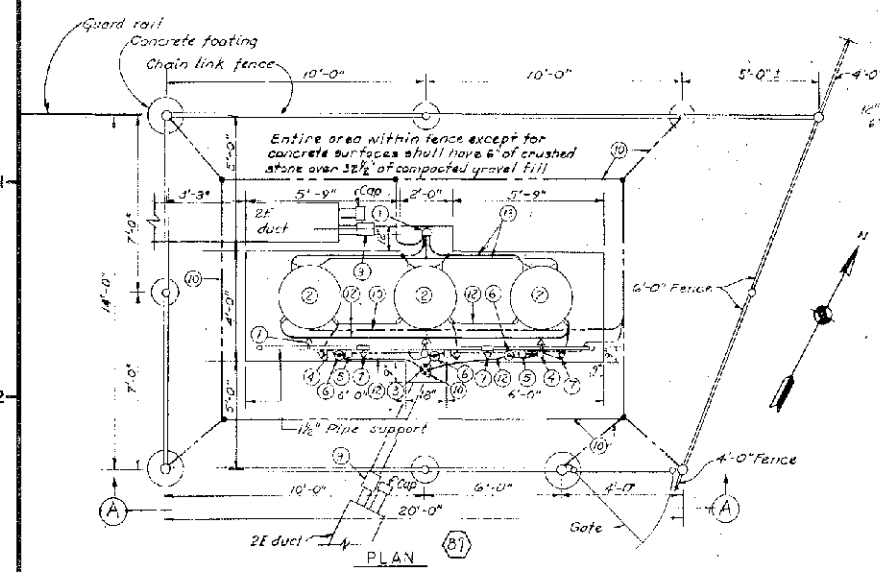
APPROVED: Chief, Engineering Division
DATE MARCH 1962

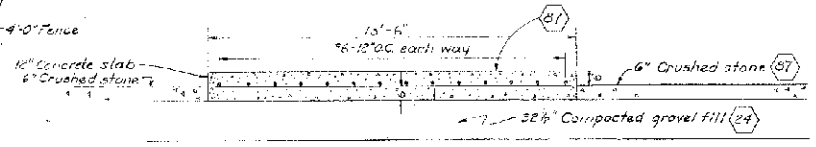
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DRAWING NUMBER
CT-I-5791

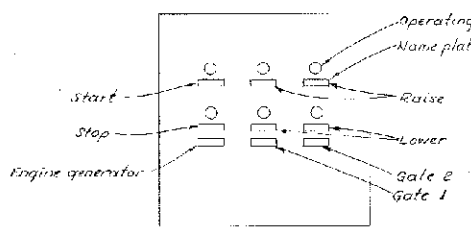
SHEET 85

CORPS OF ENGINEERS — U. S. ARMY



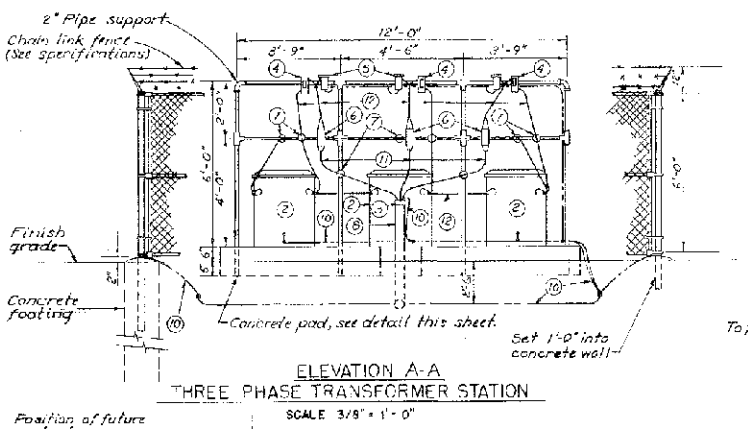


TRANSFORMER PAD DETAIL
NO SCALE

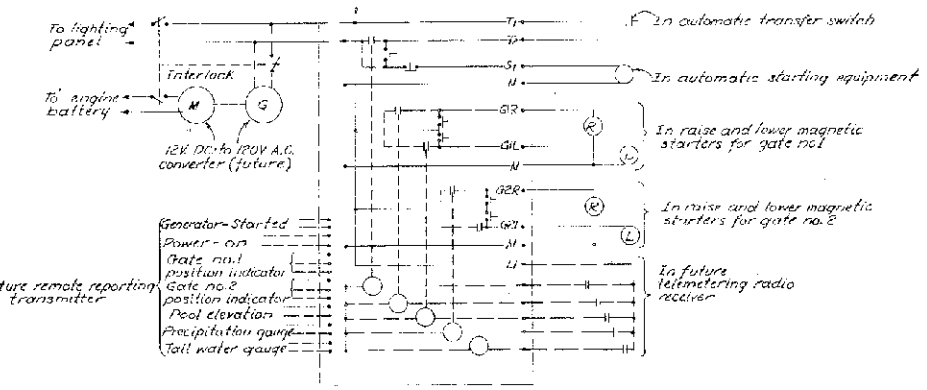


REMOTE CONTROL PANEL (92)
SCALE 1.1/2" = 1'-0"

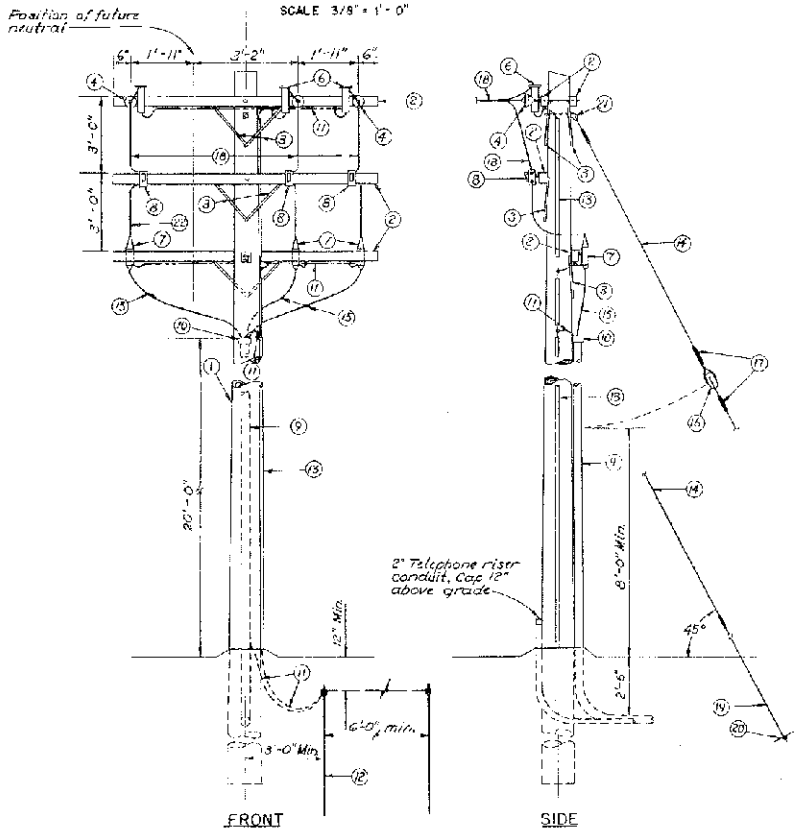
REMOTE CONTROL WIRING DIAG LEGEND	
SYMBOL	DESCRIPTION
	Relay contact
	Start button
	Stop button
	Relay coil
	wiring by this contractor
	future wiring and equipment



ELEVATION A-A
THREE PHASE TRANSFORMER STATION
SCALE 3/8" = 1'-0"



REMOTE CONTOL PANEL
WIRING DIAGRAM



RISER POLE DETAIL
SCALE 3/8" = 1'-0"

MATERIAL SCHEDULE FOR TRANSFORMER STATION

ITEM	DESCRIPTION
(1)	2½" Weather head
(2)	Transformer - 25 KVA., 1 phase, 2400/4160Y - 240/480 connected 2400 - 480V.
(3)	4" Cable support
(4)	Enclosed fuse cutout non-indicating, drop out type, 7.8KV 100A, 3000A. interrupting capacity.
(5)	Lightning arrester - 3KV.
(6)	Single conductor pothead 15 Kv outdoor type with cap nut & stuffing box for termination of #4 copper 5KV shielded cable
(7)	Pin type insulator-15 KV. with steel pin NEMA-EEI class-55-4
(8)	4" steel conduit, galvanized.
(9)	2½"C to 4"F reducer and adapter
(10)	No.6 stranded bare copper ground wire.
(11)	No. 4 copper cable with ozone resistant insulation for 15KV. metallic shield & neoprene jacket.
(12)	Same as item 11, except unshielded.
(13)	No.2 copper cable, 600V.

MATERIAL SCHEDULE FOR RISER POLE

ITEM	DESCRIPTION
(1)	35 Foot class 3 pole.
(2)	Single wood crossarm - 3½"x4½"x8' long.
(3)	Flat steel crossarm brace - 1⅛"x⅛"x2'-2" long.
(4)	Dead end suspension insulator, clevis type NEMA-EEI Class-52-4
(5)	Pin type insulator-15KV. with steel pin NEMA-EEI class-55-4
(6)	Lightning arrester - 3KV.
(7)	Single conductor pothead-15KV outdoor type with capnut & stuffing box for termination of #4 copper conductor 15KV shielded cable
(8)	Enclosed fuse cutout indicating non drop out type 7.8KV 100A., 3000A. interrupting capacity.
(9)	4" steel conduit, galvanized.
(10)	4" Cable support
(11)	No.6 stranded bare copper ground wire.
(12)	¾" Dia x 10'-0" long copper clad ground rod.
(13)	Ground moulding
(14)	⅜" Dia. steel galvanized utility grade guy wire, 7 strand.
(15)	No.4 copper cable with ozone resistant insulation for 15KV. Metallic shield & neoprene jacket.
(16)	Porcelain strain insulator NEMA EEI class-54-2
(17)	Preformed guy grip
(18)	No.6 stranded bare copper
(19)	Anchor rod - ¾" Dia. x 10'-0" long
(20)	Plate anchor for sand.
(21)	¾" Dia. angle eye bolt with lift plate and curved washer.
(22)	Same as item 15 except unshielded

NOTE-
Figures in hexagons indicate item Nos under which payment will be made.

GRAPHIC SCALES
3/8" = 1'-0"
1½" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

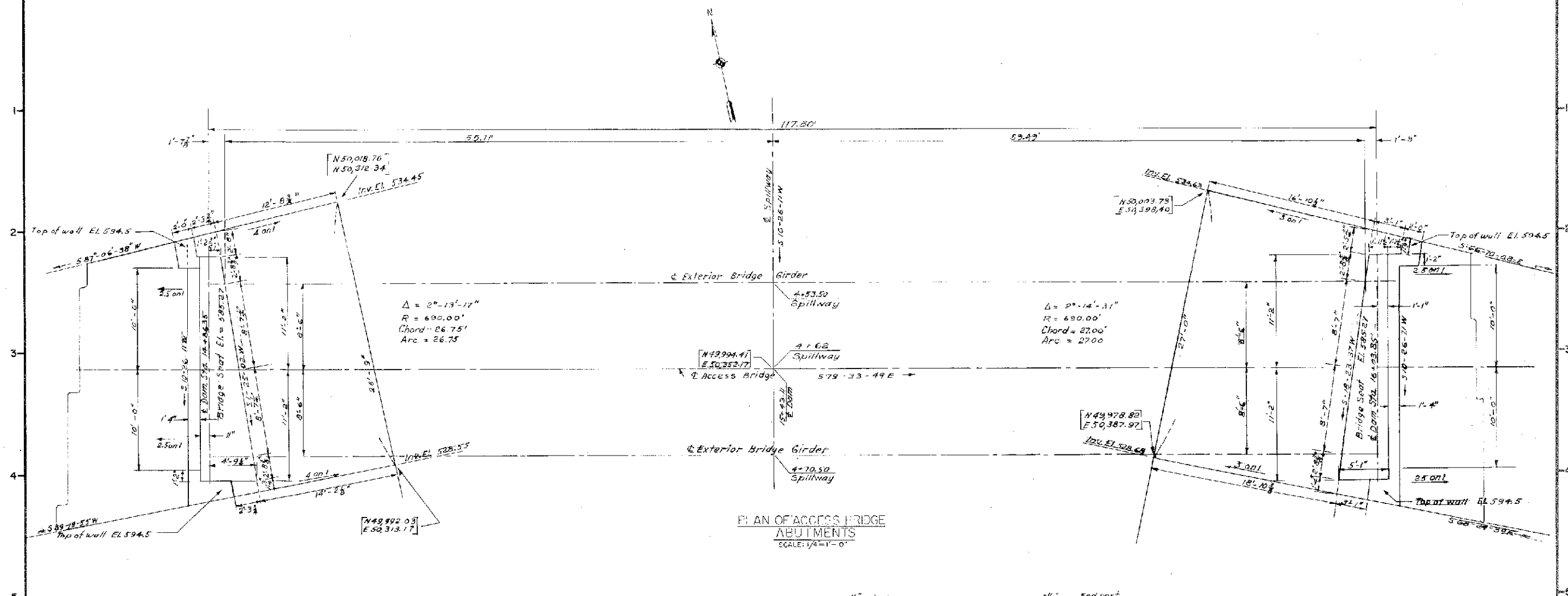
DES. BY J.J.D. DR. BY J.G.M. CH. BY
SUBMITTED
CHIEF, DESIGN SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVED
DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ELECTRICAL DISTRIBUTION SYSTEM
MISCELLANEOUS DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

SCALE AS SHOWN
SPEC. NO. CIV. ENG. 18-016-62-49
DRAWING NUMBER
CT-1-5792
SHEET 56

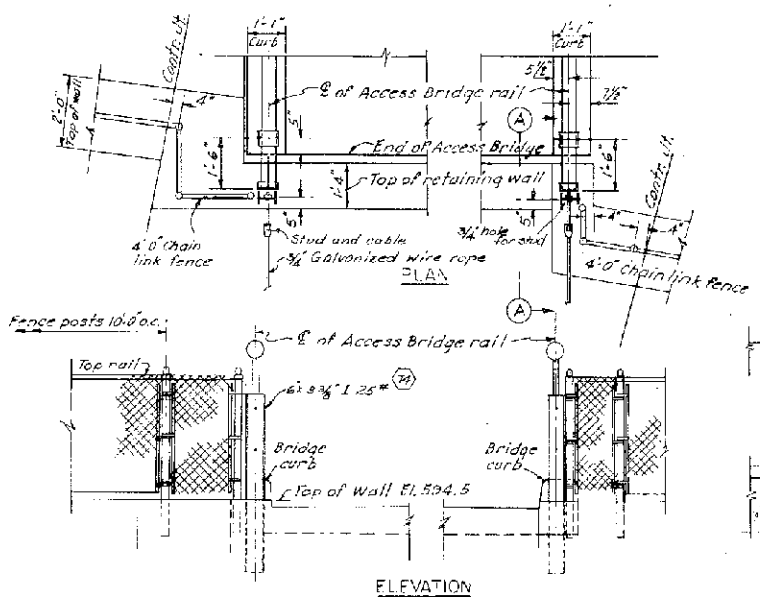
CORPS OF ENGINEERS

U. S. ARMY



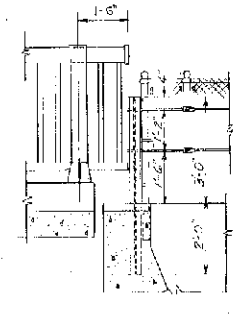
PLAN OF ACCESS BRIDGE ABUTMENTS

SCALE: 1/4"=1'-0"

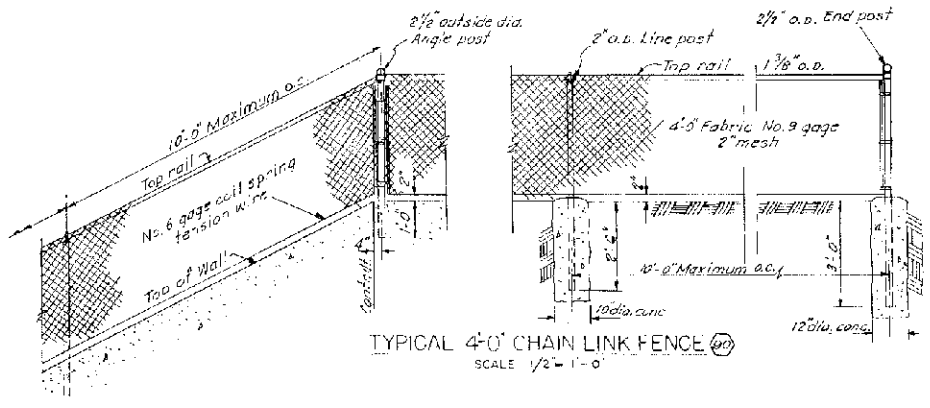


DETAIL OF CHAIN LINK FENCE AT SPILLWAY RETAINING WALLS

SCALE: 1/2"=1'-0"

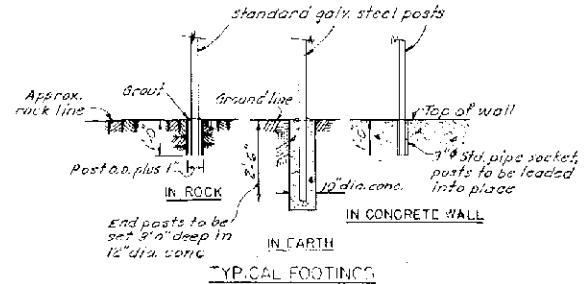


SECTION A-A



TYPICAL 4'-0" CHAIN LINK FENCE (PR)

SCALE 1/2"=1'-0"



TYPICAL FOOTINGS

SCALE: 1/2"=1'-0"

GRAPHIC SCALES

1/4" = 1'-0" 0 4' 8'

1/2" = 1'-0" 0 1' 2' 3' 4' 5'

NOTES

Elevations refer to Mean Sea Level Datum.
Figures in hexagons indicate Item Nos. under which payment will be made.
For structural joint details Sheet No. 34.
For Steel reinforcement see Sheet No. 90.
Concrete for access bridge abutments will be paid for under Item No. 48.
Concrete lining shown on this sheet will be paid for under Item No. 96.
For sections thru abutments see Sheets Nos. 35 & 37.

DIVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CH. BY
J.B	J.T.D	W.H.

PROJECT ENGINEER

A TRUE COPY RECOMMENDED

CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS BRIDGE ABUTMENTS
PLAN AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED

DATE MARCH 1962

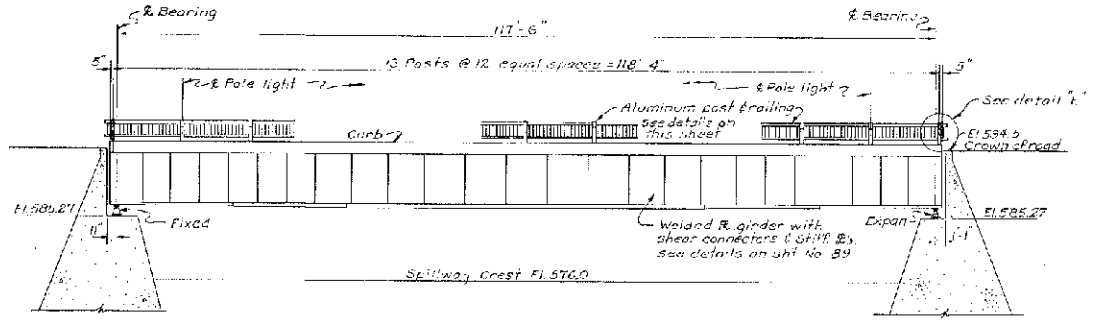
CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN SPEC. NO. CIV. ENG. 18-016-62-49

DRAWING NUMBER
CT-1-5793

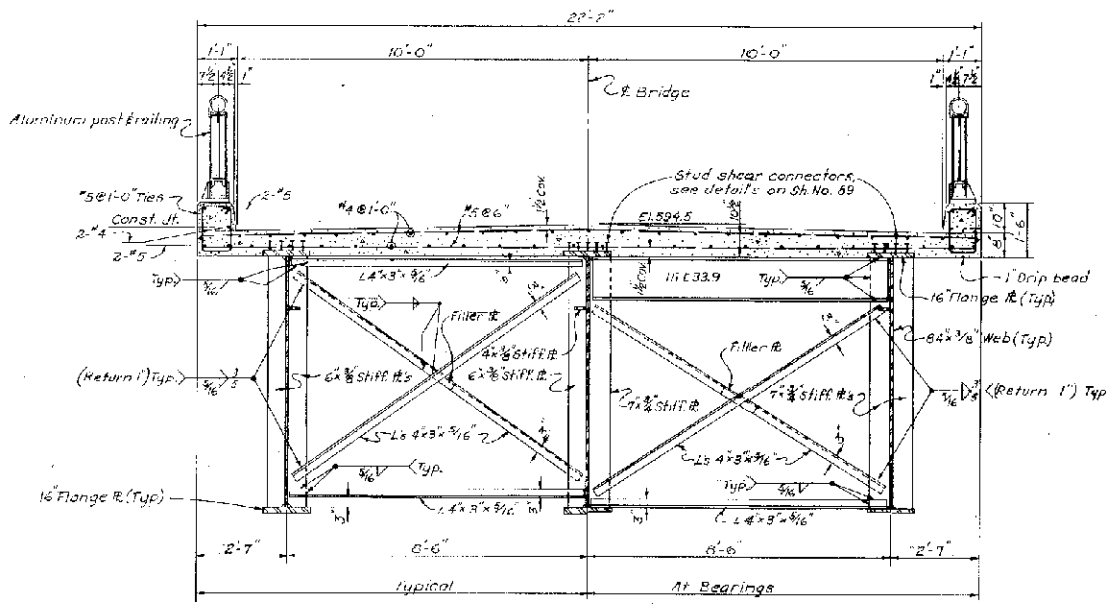
SHEET 87

CORPS OF ENGINEERS — U. S. ARMY

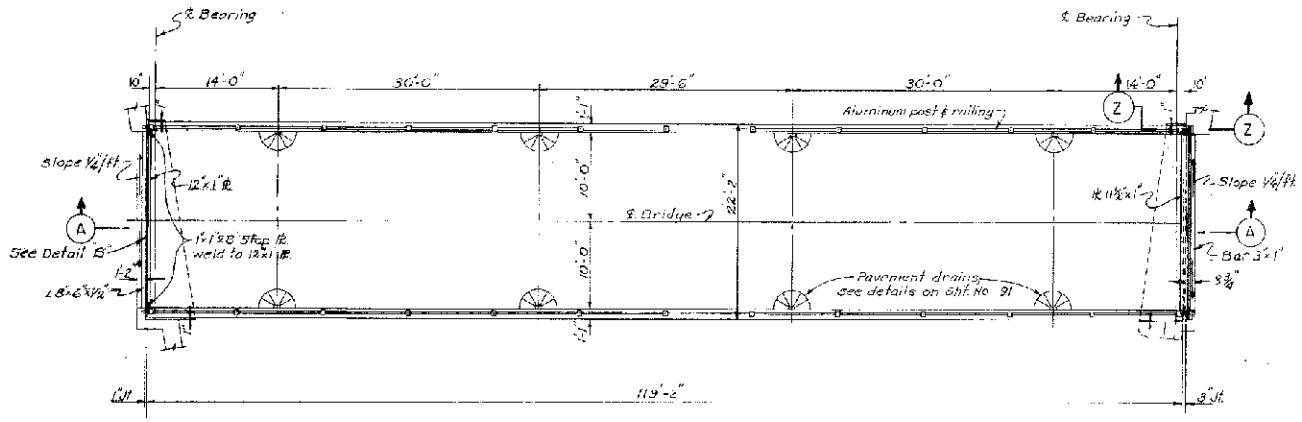


Camber girders 4½"
See Camber Diagram Sh No 89

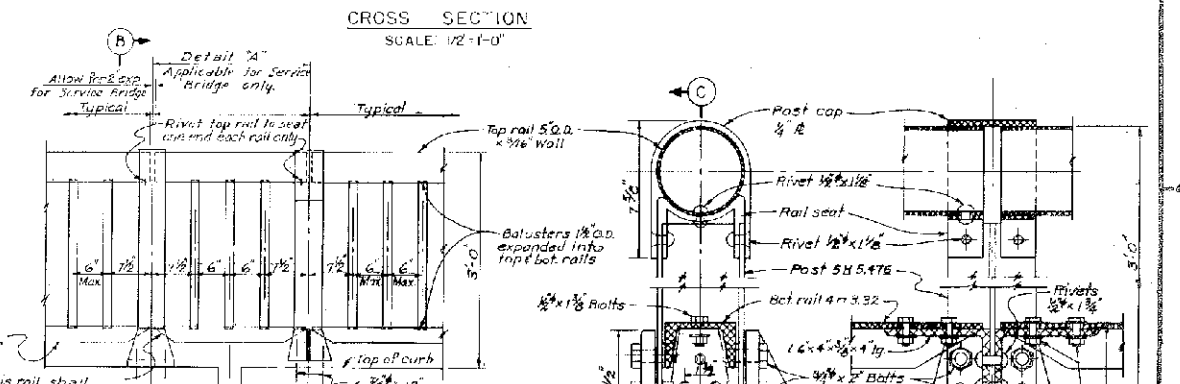
ELEVATION
SCALE: 1"=10'-0"

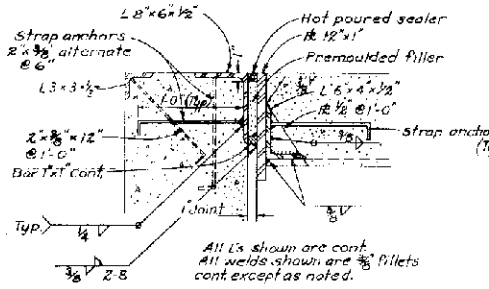


CROSS SECTION
SCALE: 1/2"=1'-0"



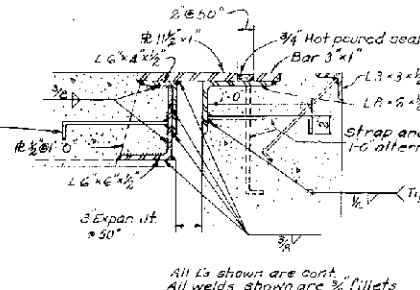
PLAN
SCALE: 1/8"=1'-0"





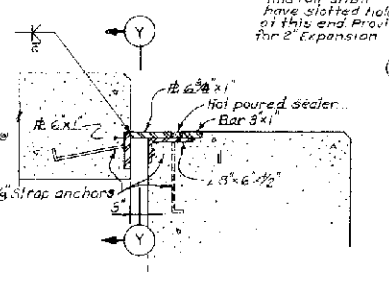
All L's shown are cont.
All welds shown are ⅜" fillets cont except as noted.

DETAIL "B"
SCALE: 1 1/2"=1'-0"

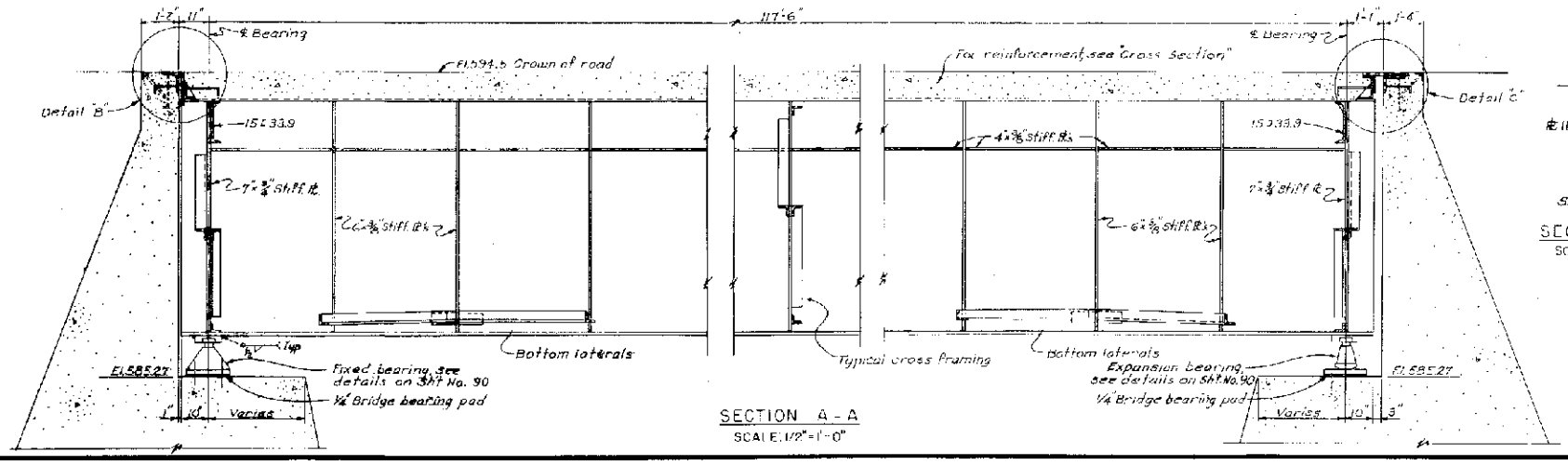


All L's shown are cont.
All welds shown are ⅜" fillets cont except as noted.

DETAIL "C"
SCALE: 1 1/2"=1'-0"

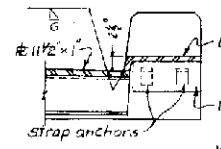


SECTION Z-Z
SCALE: 1"=1'-0"



SECTION A-A
SCALE: 1/2"=1'-0"

TYPICAL ALUMINUM RAILING DETAILS



SECTION Y-Y
SCALE: 1"=1'-0"

NOTES:
All posts, railings, bolts, nuts, etc., except anchor bolts shall be aluminum. Anchor bolts shall be corrosion resistance steel. (See Specifications)

For "General Notes" see Sheet No. 90.
For Detail of "Construction Joints in Bridge Slab" see Sheet No. 91.
For payment item numbers see Sheet No. 90.

GRAPHIC SCALES

1" = 10' — 10' 0 10' 20'
1/8" = 1'-0" — 4' 0 4' 8' 12' 16' 20'
1/2" = 1'-0" — 1' 0 1' 2' 3' 4' 5'
1" = 1'-0" — 1' 0 1' 2'
1 1/2" = 1'-0" — 12" 9" 6" 3" 0 6" 12"
3" = 1'-0" — 3" 0 3" 6" 9"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

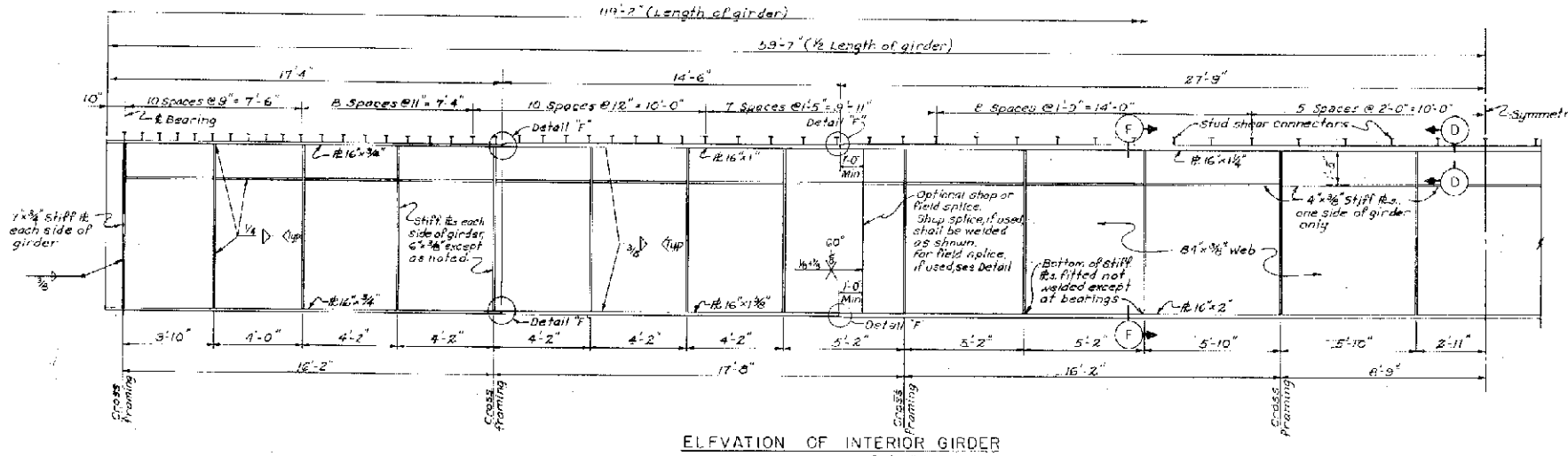
DES. BY	CK. BY	CK. BY
L.S.P.	J.P.H.	

SUBMITTED: H. M. Whitman, CHIEF, STRUCT. SECTION
PROJECT ENGINEER: Sandler
APPROVAL RECOMMENDED: Chief, Design Branch
APPROVED: Chief, Engineering Division
DATE: MARCH 1962

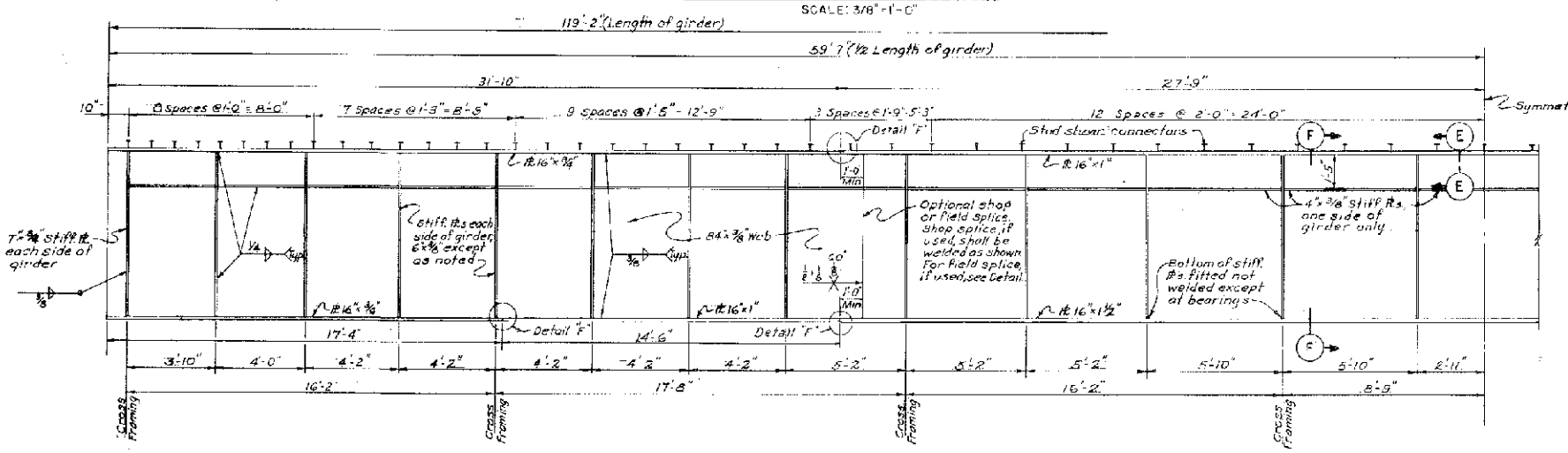
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS BRIDGE
STRUCTURAL STEEL DETAILS NO. I
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE AS SHOWN | SPEC NO GIVING: 19-016-62-48
DRAWING NUMBER: CT-I-5794
SHEET 88

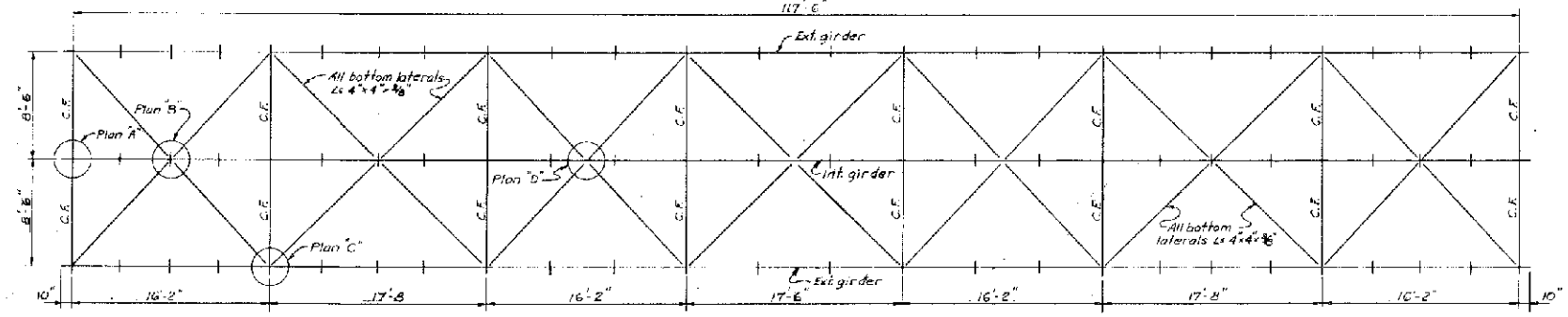
CORPS OF ENGINEERS — U.S. ARMY



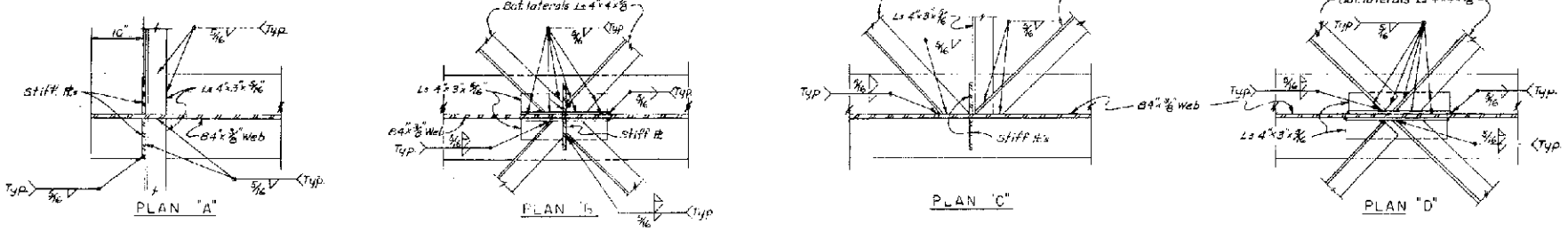
ELEVATION OF INTERIOR GIRDER
SCALE: 3/8" = 1'-0"



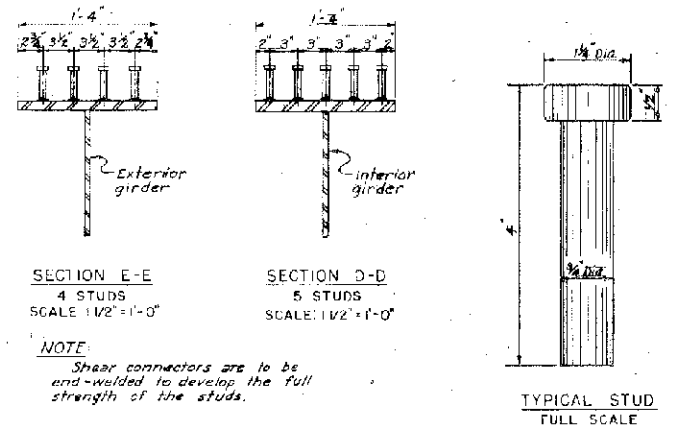
ELEVATION OF EXTERIOR GIRDER
SCALE: 3/8" = 1'-0"



FRAMING PLAN
NO SCALE



TYPICAL LATERAL BRACING CONNECTIONS
SCALE: 1"=1'-0"



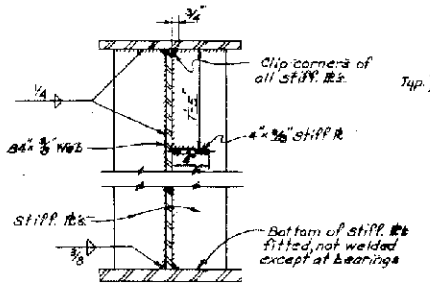
SECTION E-E
4 STUDS
SCALE 1 1/2" = 1'-0"

SECTION D-D
5 STUDS
SCALE: 1 1/2" = 1'-0"

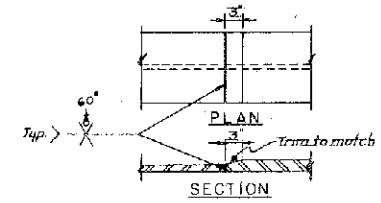
NOTE
Shear connectors are to be end-welded to develop the full strength of the studs.

TYPICAL STUD
FULL SCALE

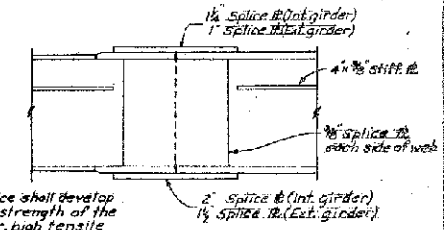
SHEAR CONNECTOR DETAILS



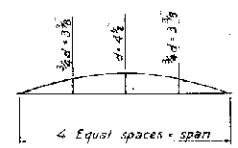
SECTION F-F
NOT TO SCALE



DETAIL "F"
NOT TO SCALE



FIELD SPLICE DETAIL
NOT TO SCALE



CAMBER DIAGRAM

NOTES:
1. For "General Notes" see Sheet No. 90.
2. For payment item numbers see Sheet No. 90.

GRAPHIC SCALES
3/8" = 1'-0" 4' 0 4'
1" = 1'-0" 1' 0 1' 2'
1 1/2" = 1' 0" 12" 9" 6" 3" 0 6" 12"

REVISION	DATE	DESCRIPTION	BY

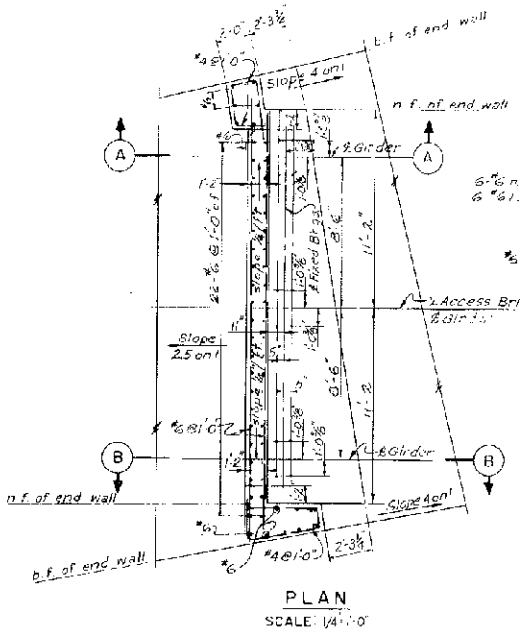
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY L.S.P.	DR. BY J.P.H.	CK. BY J.S.B.
SUBMITTED		
CHIEF, STRUCT. SECTION		
PROJECT ENGINEER		
APPROVAL RECOMMENDED		
CHIEF, DESIGN BRANCH		
APPROVED		
CHIEF, ENGINEERING DIVISION		

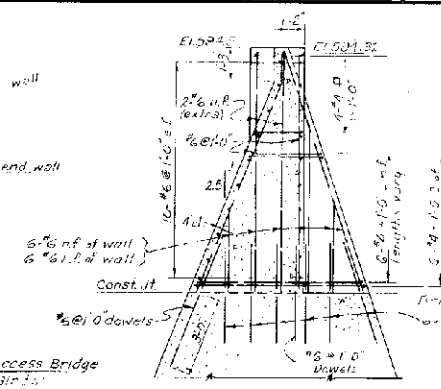
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS BRIDGE
STRUCTURAL STEEL DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS
APPROVED DATE MARCH 1962

SCALES AS SHOWN | SPEC. NO. CIVENG 62-015-62-43
DRAWING NUMBER
CT-1-5795
SHEET 89

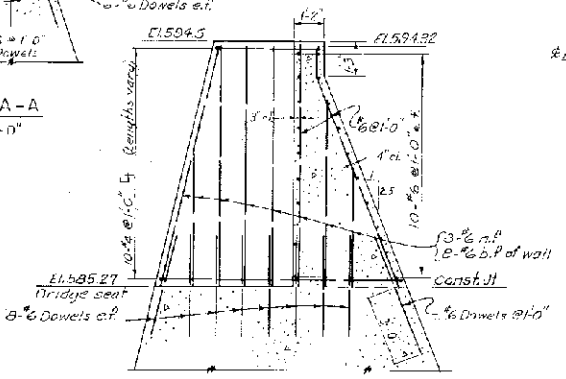
CORPS OF ENGINEERS — U. S. ARMY



PLAN
SCALE: 1/4"=1'-0"

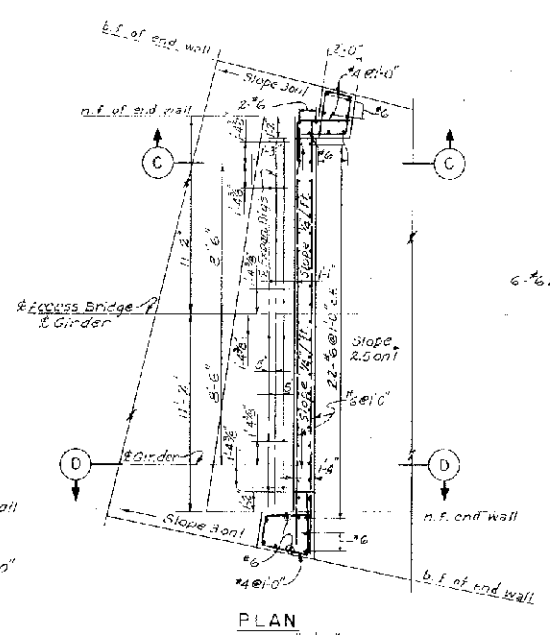


SECTION A-A
SCALE: 3/8"=1'-0"

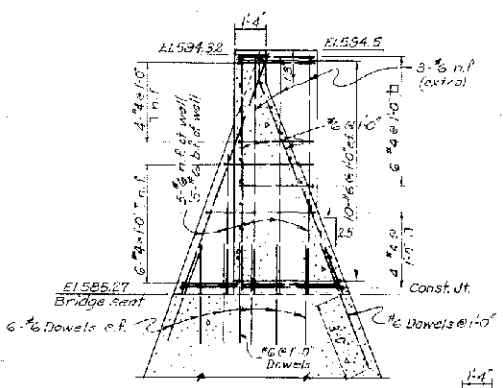


SECTION B-B
SCALE: 3/8"=1'-0"

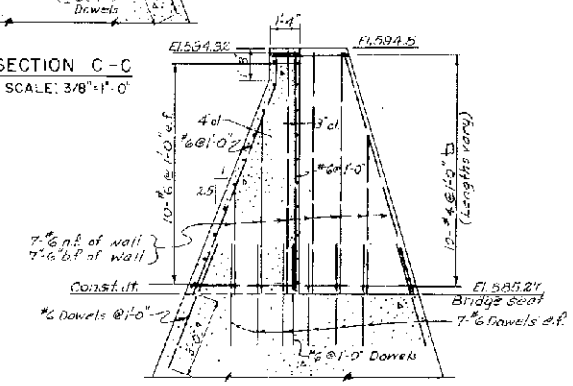
ACCESS BRIDGE
WEST ABUTMENT DETAILS



PLAN
SCALE: 1/4"=1'-0"

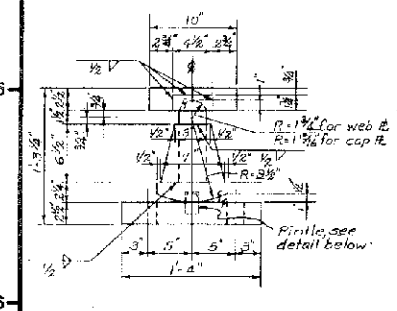


SECTION C-C
SCALE: 3/8"=1'-0"

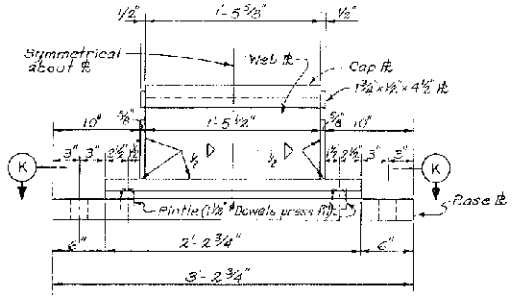


SECTION D-D
SCALE 3/8"=1'-0"

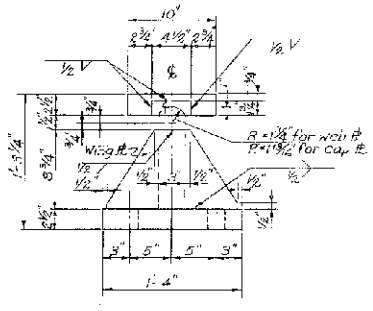
ACCESS BRIDGE
EAST ABUTMENT DETAILS



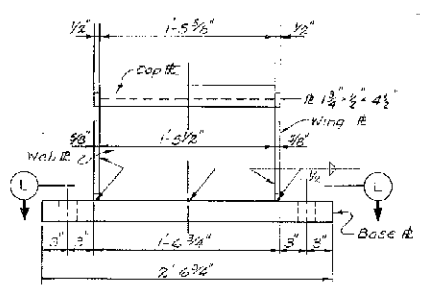
END ELEVATION



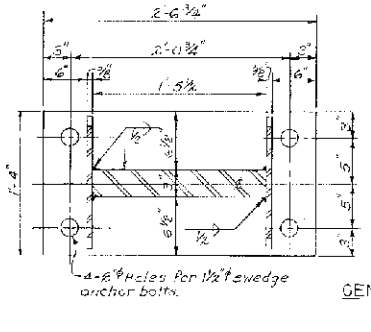
SIDE ELEVATION



END ELEVATION

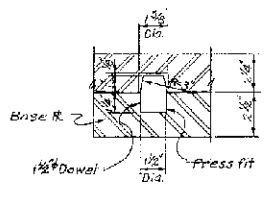


SIDE ELEVATION

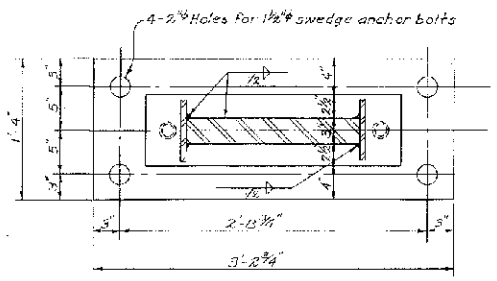


SECTION L-L

FIXED BEARING DETAILS
SCALE: 1 1/2"=1'-0"



PINTLE
SCALE 3"=1'-0"



SECTION K-K

EXPANSION BEARING DETAILS
SCALE 1 1/2"=1'-0"

NOTES:
All anchor bolts shall be 1½ø Swedged type and embedded 1'-6" in concrete.
Bridge bearings shall be fabricated from structural steel.

GENERAL NOTES:
Elevations refer to Mean Sea Level Datum.
Bar splices shall lap 30 diams. of the smaller bar.
Minimum cover for main reinforcement shall be 3" except as noted otherwise.
All flange plates shall be U.M. plate.
Holes and bolts for erection of cross frames may be used.
Contractor shall submit details of supports for the girders during field or shop splicing operations to insure proper camber is maintained.

PAYMENT ITEM NUMBERS
Concrete in Access Bridge Abutments Item No. 48
Concrete in bridge superstructure Item No. 61
Steel reinforcement Item No. 64
Structural steel in Access Bridge, except pavement drains, Item No. 76
Pavement drains Item No. 73.
Aluminum railings Item No. 77.

GRAPHIC SCALES
3"=1'-0"
1/4"=1'-0"
3/8"=1'-0"
1 1/2"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

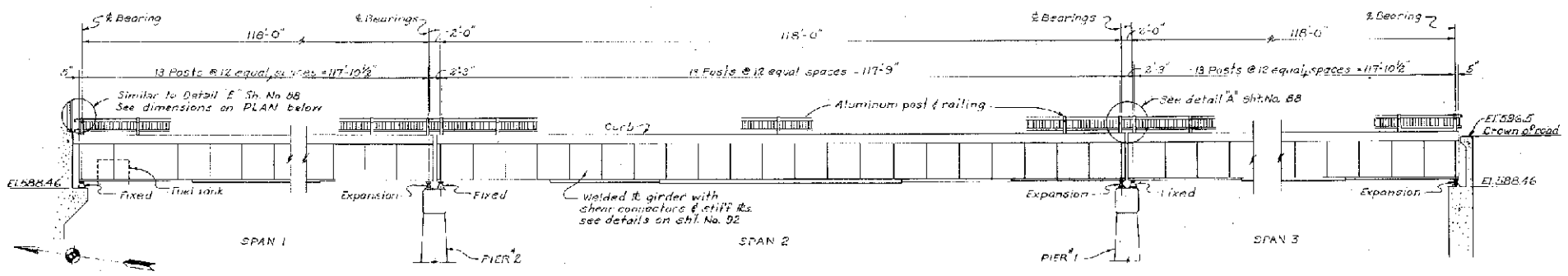
DES. BY L.S.P. | DR. BY J.P.H. | CK. BY

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, ENGINEERING BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

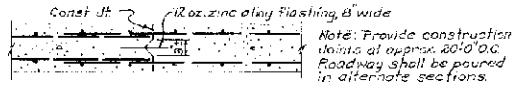
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
ACCESS AND SERVICE BRIDGES
STRUCTURAL
BEARING AND ABUTMENT DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5796
SHEET NO.

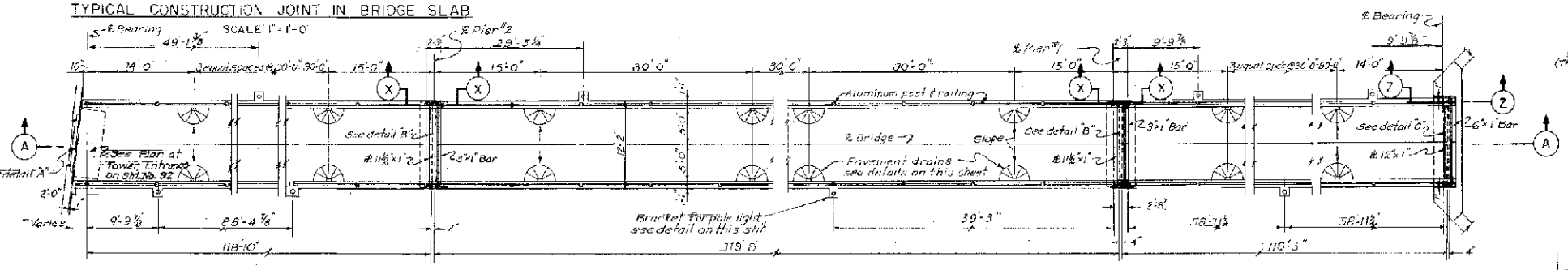
CORPS OF ENGINEERS — U. S. ARMY

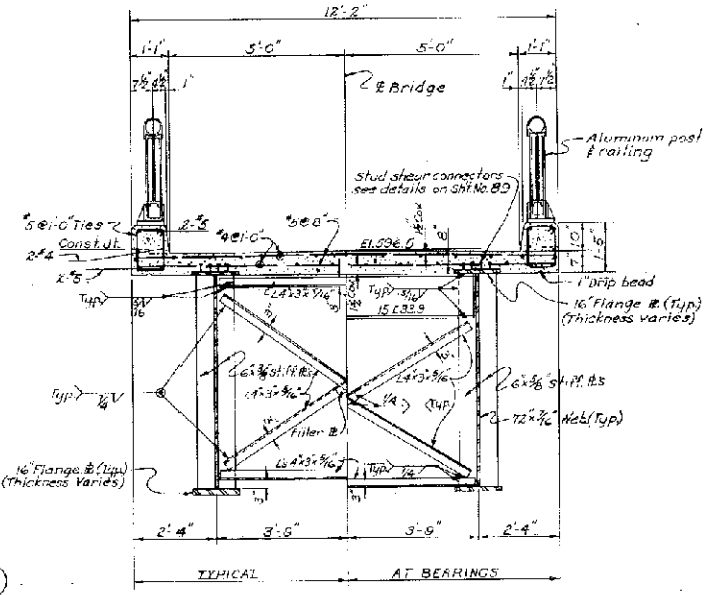


ELEVATION
SCALE: 1"=10'-0"

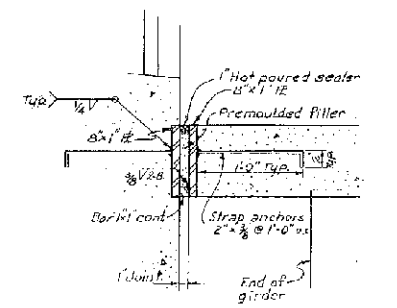


TYPICAL CONSTRUCTION JOINT IN BRIDGE SLAB

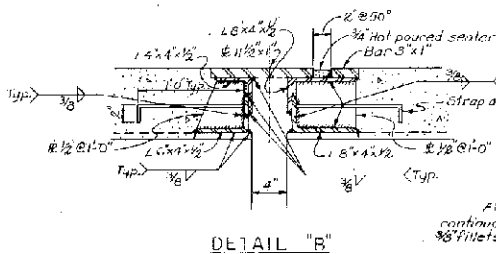




CROSS SECTION
SCALE 1/2"=1'-0"

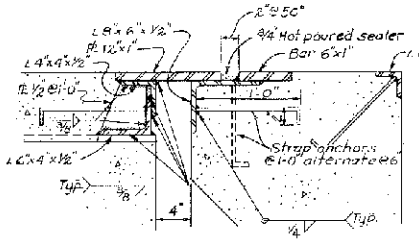


DETAIL "A"
SCALE: 1 1/2"=1'-0"

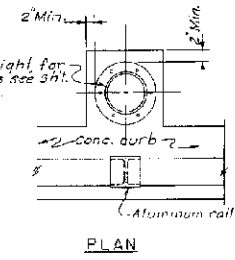


DETAIL "B"
SCALE: 1 1/2"=1'-0"

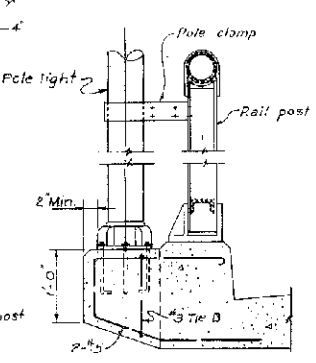
Fill Ls shown are continuous. All welds are ⅜" fillets cont except as noted.



DETAIL "C"
SCALE: 1 1/2"=1'-0"

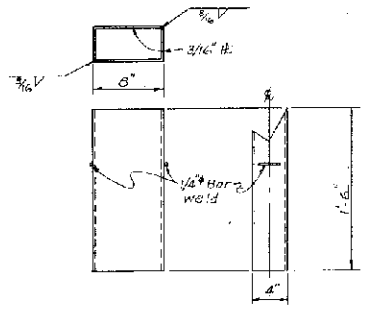


PLAN



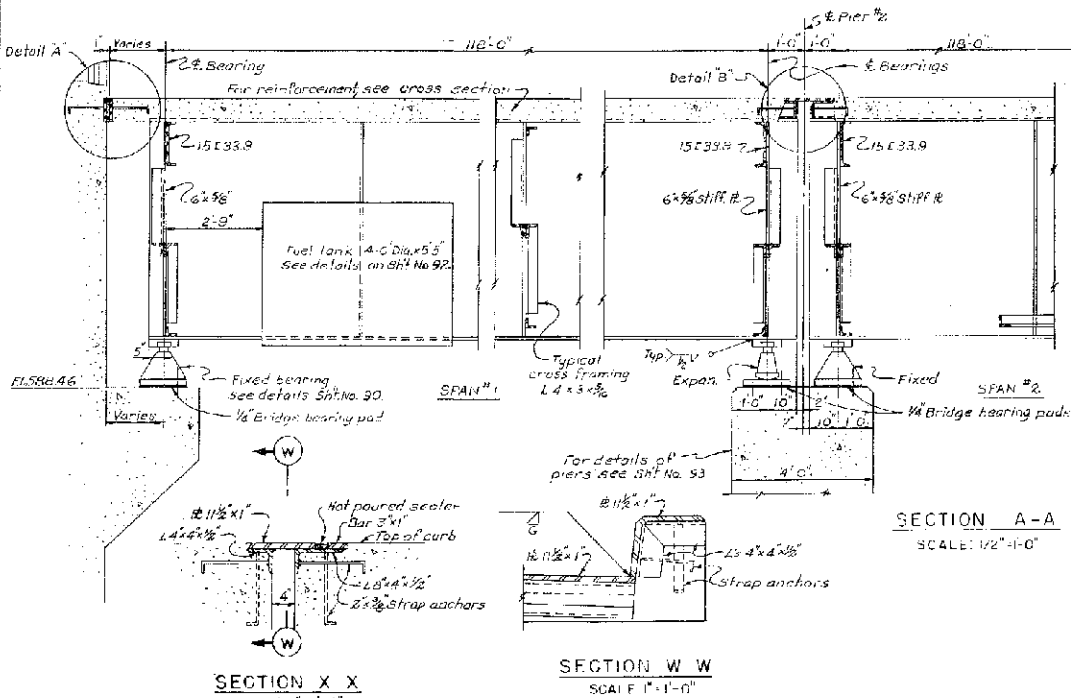
SECTION

TYPICAL BRACKET FOR POLE LIGHT
SCALE: 1"=1'-0"



DRAIN
SCALE: 1 1/2"=1'-0"

PLAN
SCALE 1/2"=1'-0"



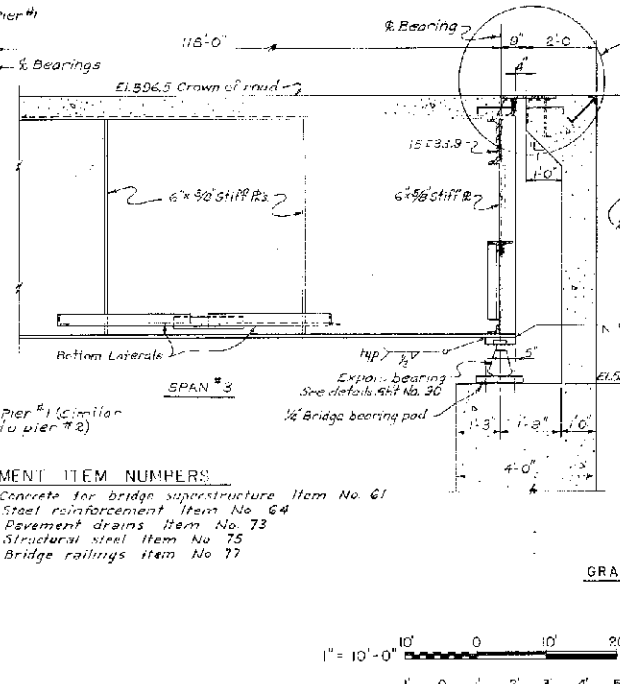
SECTION A-A
SCALE: 1/2"=1'-0"

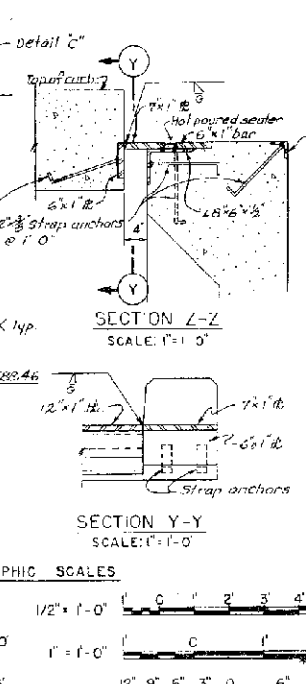
SECTION X X
SCALE 1"=1'-0"

SECTION W W
SCALE 1"=1'-0"

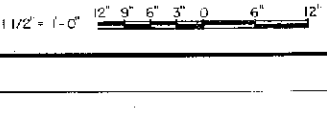
PAYMENT ITEM NUMBERS

Concrete for bridge superstructure Item No. 61
Steel reinforcement Item No. 64
Pavement drains Item No. 73
Structural steel Item No. 75
Bridge railings Item No. 77

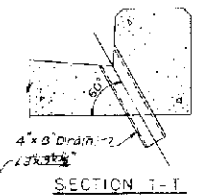




SECTION Z-Z
SCALE: 1"=1'-0"



SECTION Y-Y
SCALE: 1"=1'-0"



SECTION T-T
SCALE: 1"=1'-0"

PAVEMENT DRAIN DETAILS

NOTE:
For General Notes see Sheet No. 90

GRAPHIC SCALES

1/2" = 1'-0"
1" = 1'-0"
1" = 10'-0"
1/8" = 1'-0"
1 1/2" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
J.S.M.	J.P.H.	

SUBMITTED
CHIEF, STRUCT. SECTION
PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, ENGINEERING BRANCH

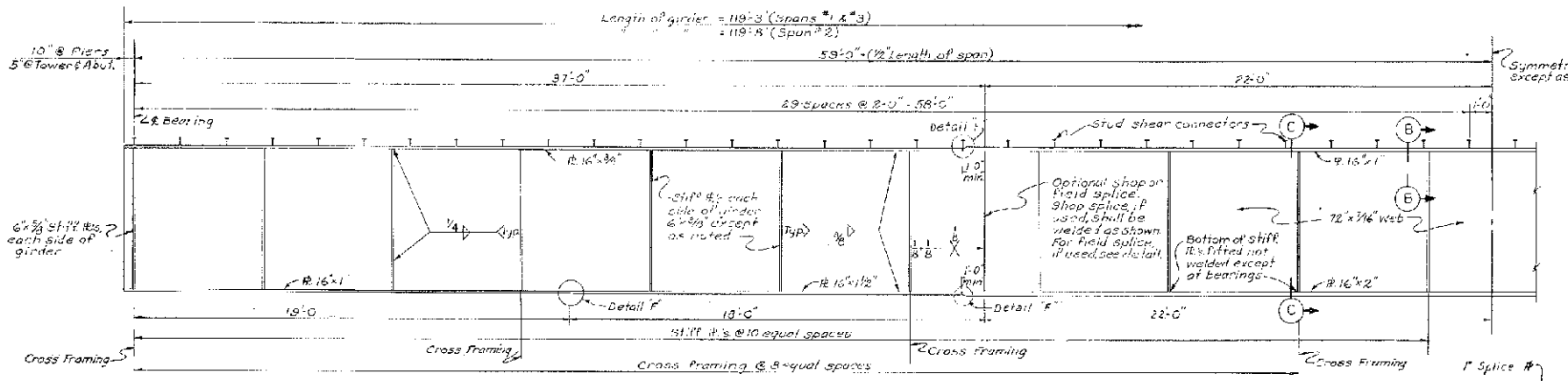
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SERVICE BRIDGE
STRUCTURAL STEEL DETAILS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

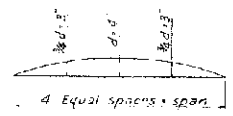
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5797
SHEET 91

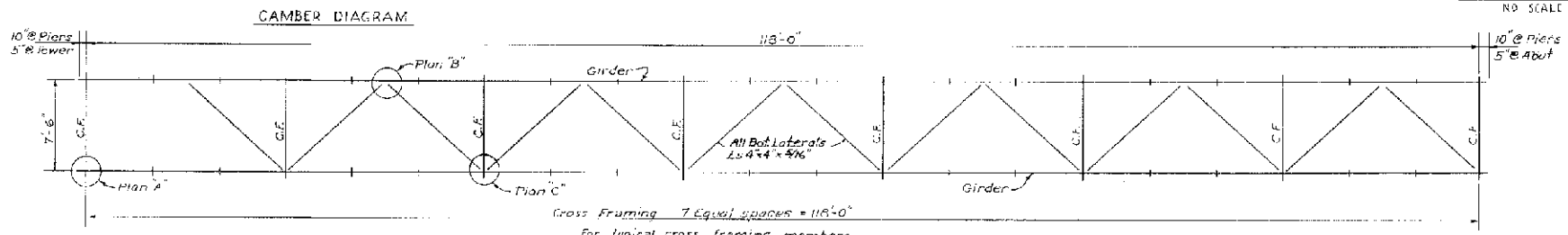
CORPS OF ENGINEERS — U. S. ARMY



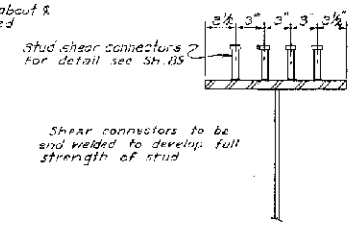
GIRDER ELEVATION
6 REQUIRED
SCALE: 3/8" = 1'-0"



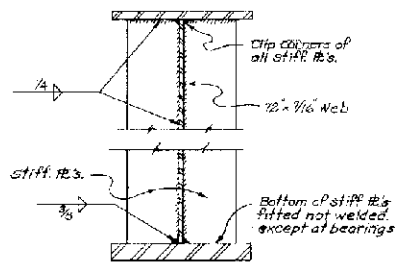
CAMBER DIAGRAM



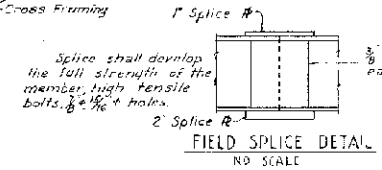
FRAMING PLAN
NO SCALE



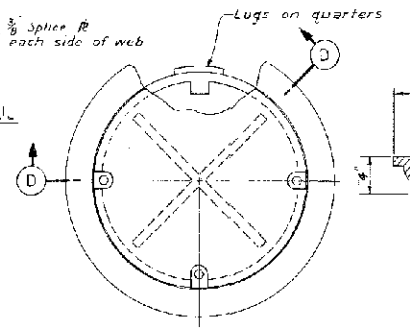
SECTION B-B
SCALE: 1 1/2" = 1'-0"

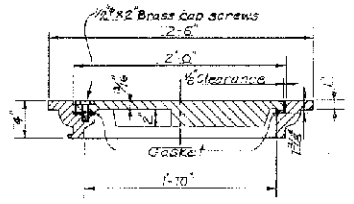


SECTION C-C
NOT TO SCALE



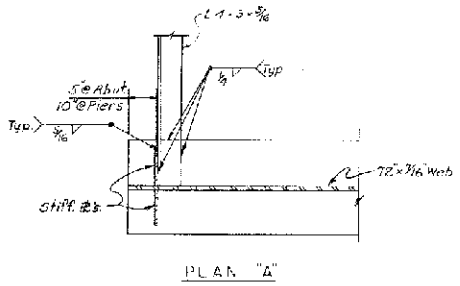
FIELD SPLICE DETAIL
NO SCALE



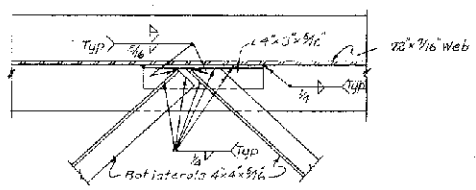


SECTION D-D

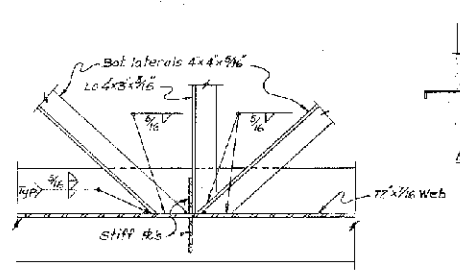
MANHOLE DETAILS
SCALE: 1 1/2" = 1'-0"



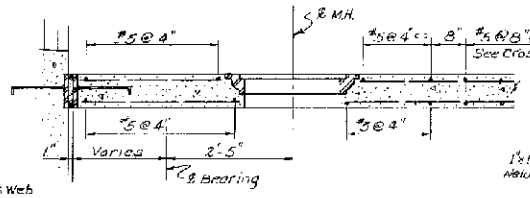
PLAN "A"



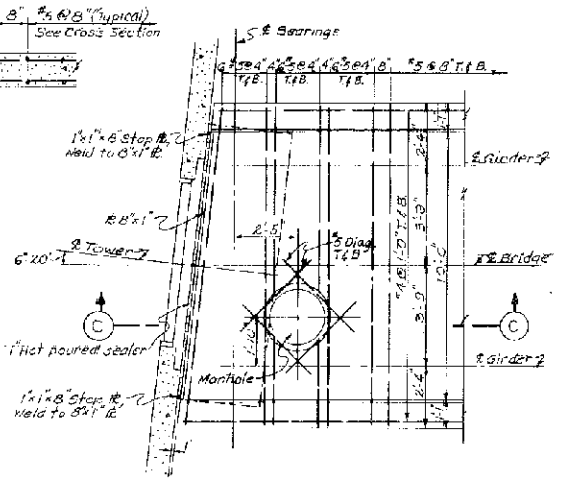
PLAN "B"



PLAN "C"

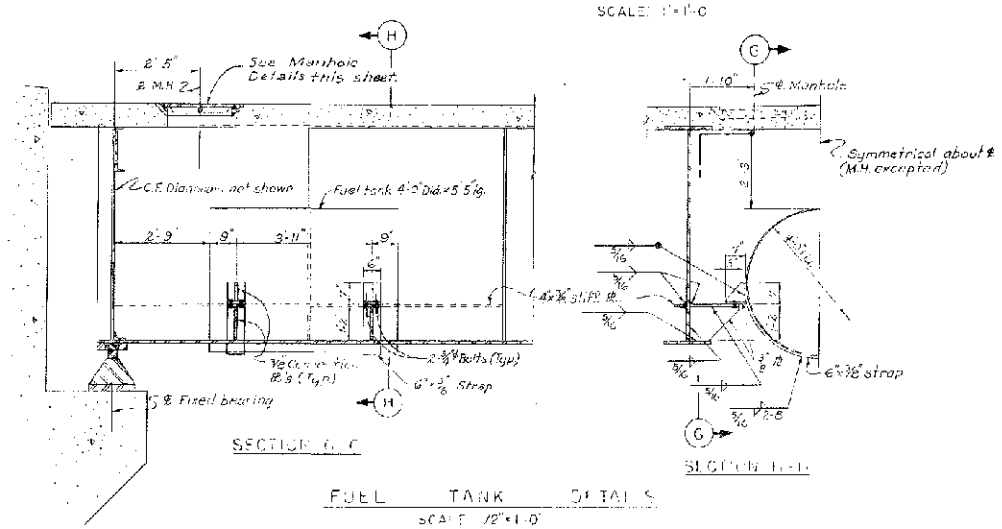


SECTION C-C
SCALE: 3/4" = 1'-0"

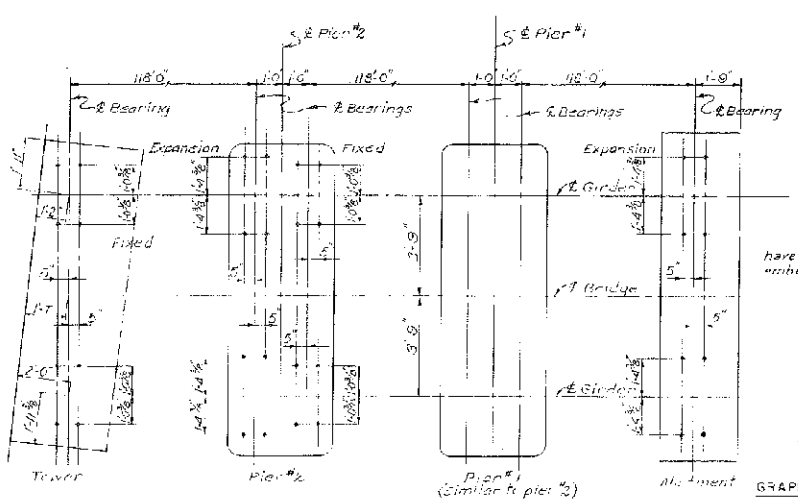


PLAN AT TOWER ENTRANCE
SCALE 3/8" = 1'-0"

TYPICAL LATERAL BRACING CONNECTIONS
SCALE: 1" = 1'-0"



FUEL TANK DETAILS
SCALE: 1/2" = 1'-0"



ANCHOR BOLT PLAN
NOT TO SCALE
3/4" = 1'-0"
3/8" = 1'-0"

GRAPHIC SCALES
1/2" = 1'-0"
1" = 1'-0"
1 1/2" = 1'-0"

NOTE: For general notes applying to this sheet see Sheet No. 90.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

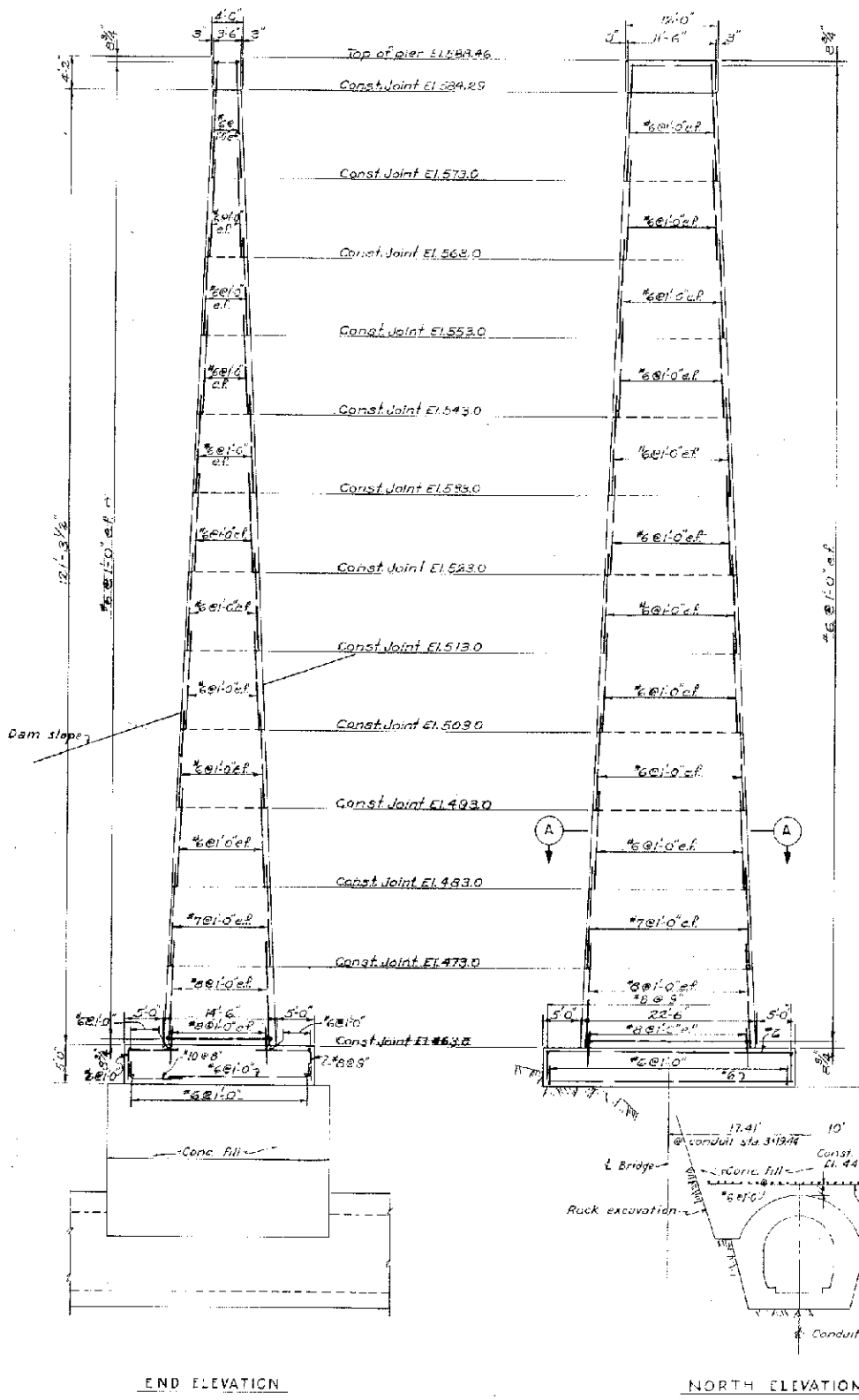
DES. BY J.S.M. | DR. BY J.P.H. | CK. BY

SUBMITTED: CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED: CHIEF, HYDRAULIC BRANCH
APPROVAL RECOMMENDED: CHIEF, P & R BRANCH
APPROVED: CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SERVICE BRIDGE
STRUCTURAL STEEL DETAILS NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

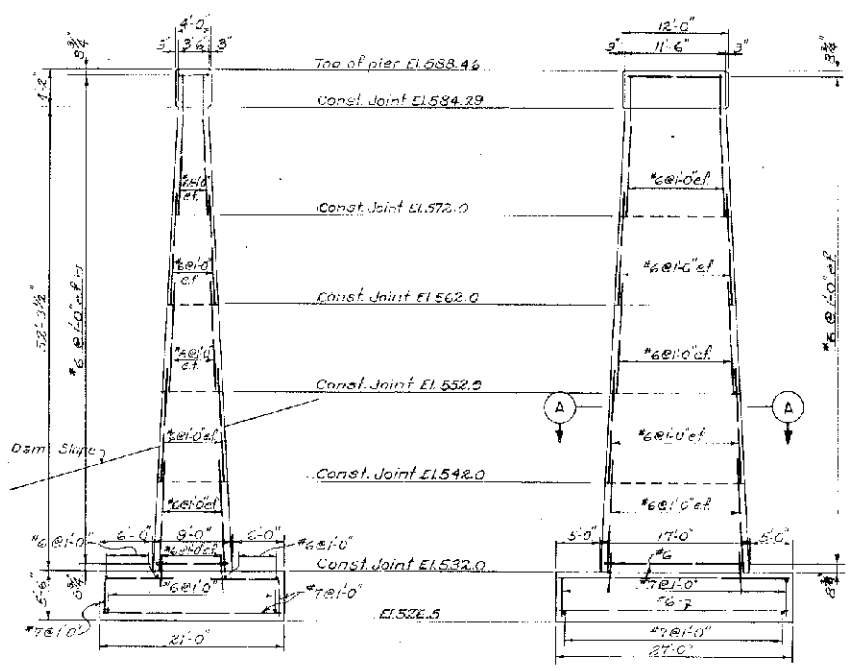
SCALE AS SHOWN SPEC. NO. CIV ENG.-19-016-62-19
DRAWING NUMBER
CT-1-5798
SHEET 92

CORPS OF ENGINEERS — U.S. ARMY



END ELEVATION — NORTH ELEVATION

PIER NO. 2
SCALE 1/8"=1'-0"

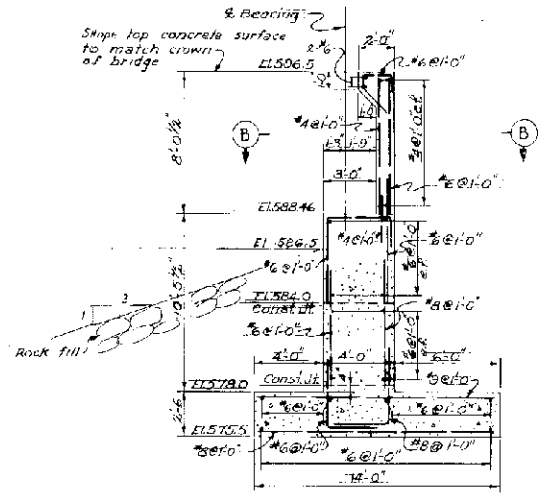


END ELEVATION — NORTH ELEVATION

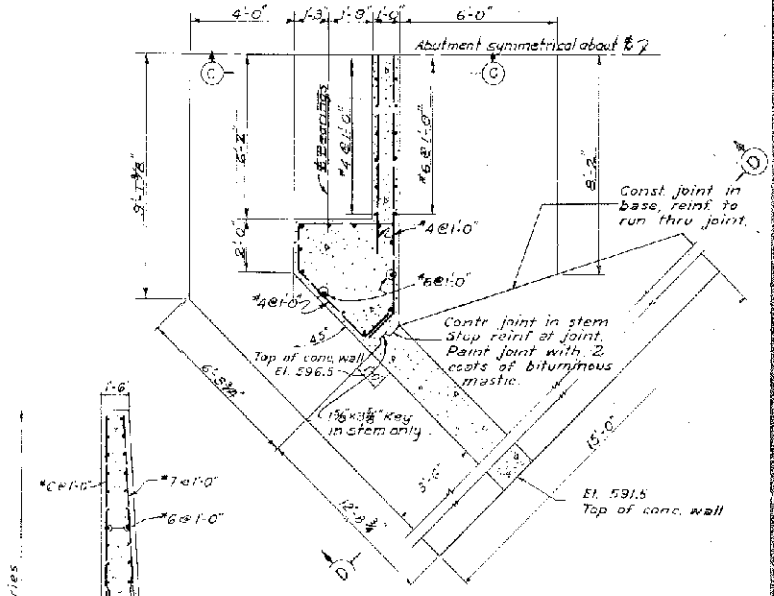
PIER NO. 1
SCALE 1/8"=1'-0"

PLAN - PIER NO.1 & NO.2
SCALE: 1/4"=1'-0"

SECTION A-A
NOT TO SCALE



SECTION C-C
SCALE: 1/4"=1'-0"



SECTION B-B
ABUTMENT DETAILS
SCALE 3/8"=1'-0"

SECTION D-D
SCALE 1/4"=1'-0"

NOTES

All construction joints above grade shall be V-joints conforming to construction joint detail on Sheet 34. Construction joints below grade shall be flush joints.

PAYMENT ITEM NUMBERS:
Steel bearing piling Item No. 36
Concrete for abutment & piers Item No. 60
Steel reinforcement Item No. 64

GRAPHIC SCALES
1/8" = 1'-0"
3/16" = 1'-0"
1/4" = 1'-0"
3/8" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY J.S.M. | DR. BY J.P.H. | CK. BY

SUBMITTED — CHIEF, STRUCT. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED — CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED — CHIEF, ENGINEERING DIVISION

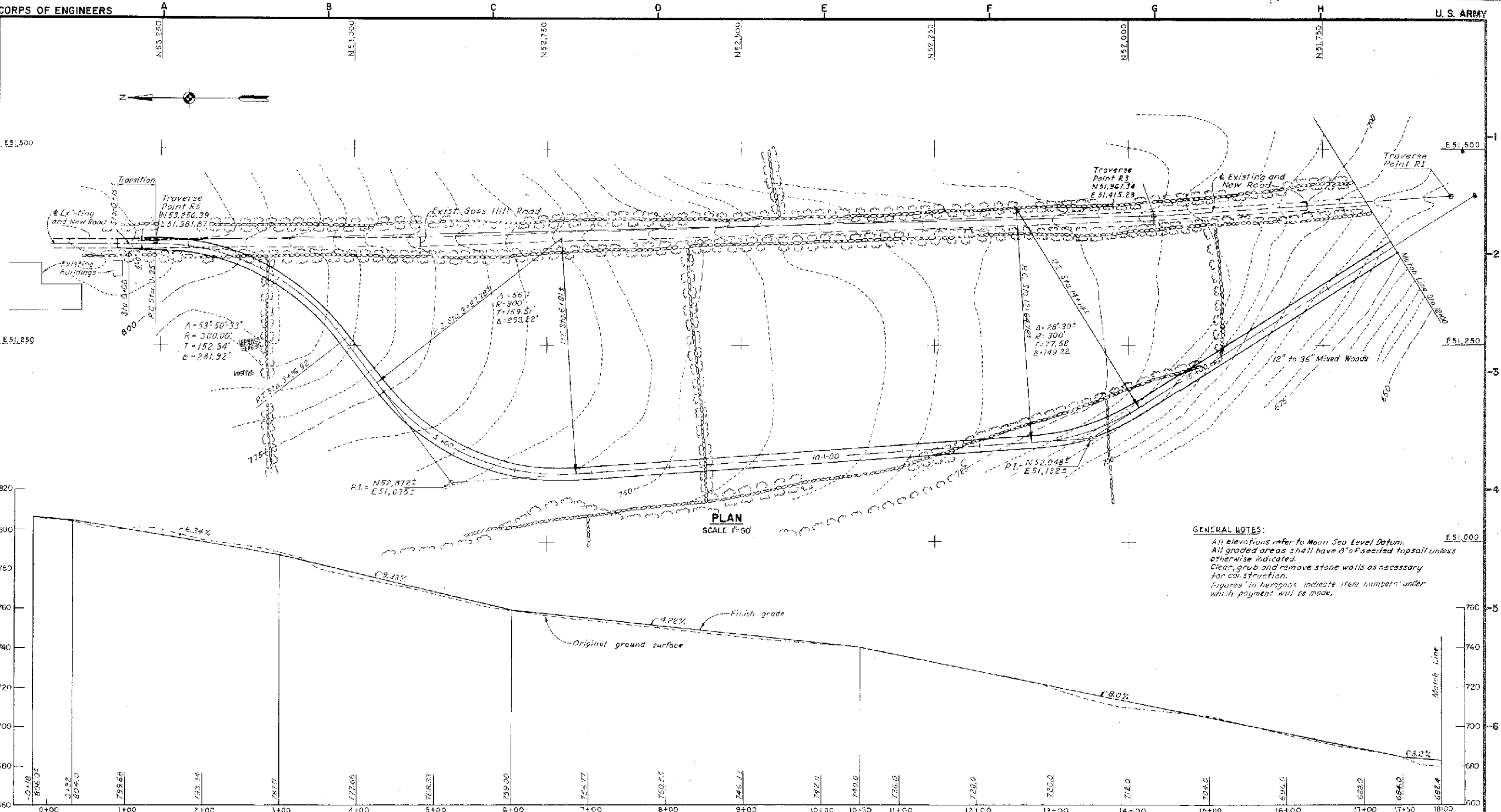
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SERVICE BRIDGE
STRUCTURAL
PIERS AND ABUTMENT DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED — CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV. ENG. 9-016-62-49
DRAWING NUMBER
CT-1-5799
SHEET 93

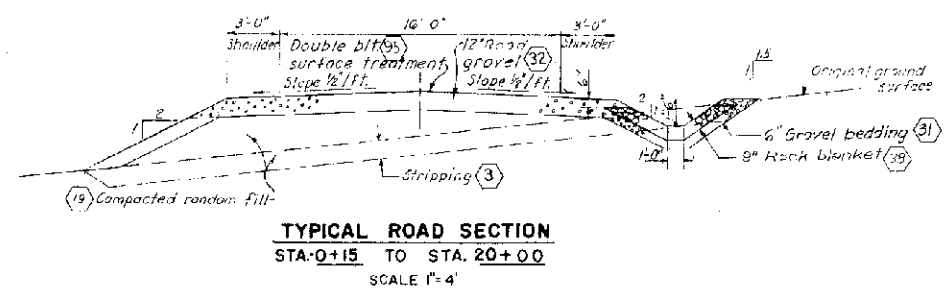
AMERICAN BLUE PRINT CO., BOSTON, MASS.

CORPS OF ENGINEERS — U.S. ARMY



℄ PROFILE

SCALE: HORZ. 1"=50'
VERT. 1"=20'



TYPICAL ROAD SECTION

STA. 0+15 TO STA. 20+00
SCALE 1"=4'

GRAPHIC SCALES

1"=4'-0" 4' 0 4' 8'
1"=20'-0" 20' 0 20' 40'
1"=50'-0" 50' 0 50' 100'

GENERAL NOTES:

All elevations refer to Mean Sea Level Datum.
All graded areas shall have 6" of seeded topsoil unless otherwise indicated.
Clean, grub and remove stone walls as necessary for construction.
Figures in hexagons indicate item numbers under which payment will be made.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.F.H. | DR. BY D.L.W. | CK. BY

SUBMITTED

CHIEF, CIVIL DESIGN BRANCH

PROJECT ENGINEER

APPROVAL RECOMMENDED

CHIEF, DESIGN BRANCH

APPROVED

CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO.1
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

DATE MAR 1962

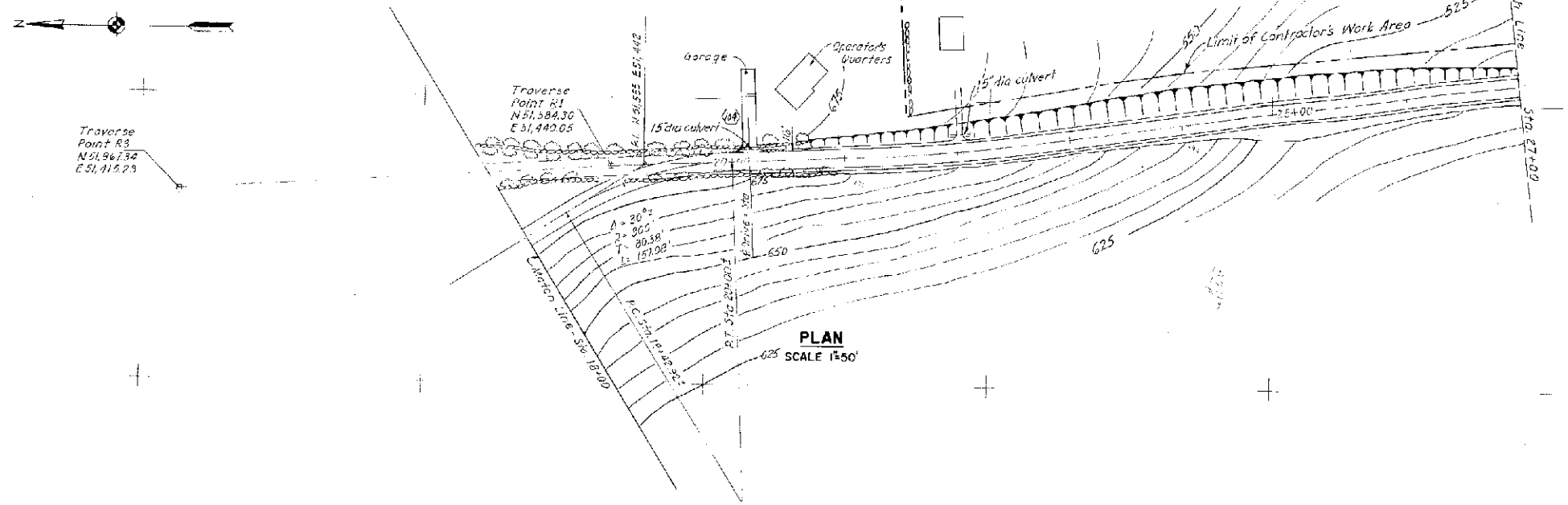
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DRAWING NUMBER
CT-1-5800

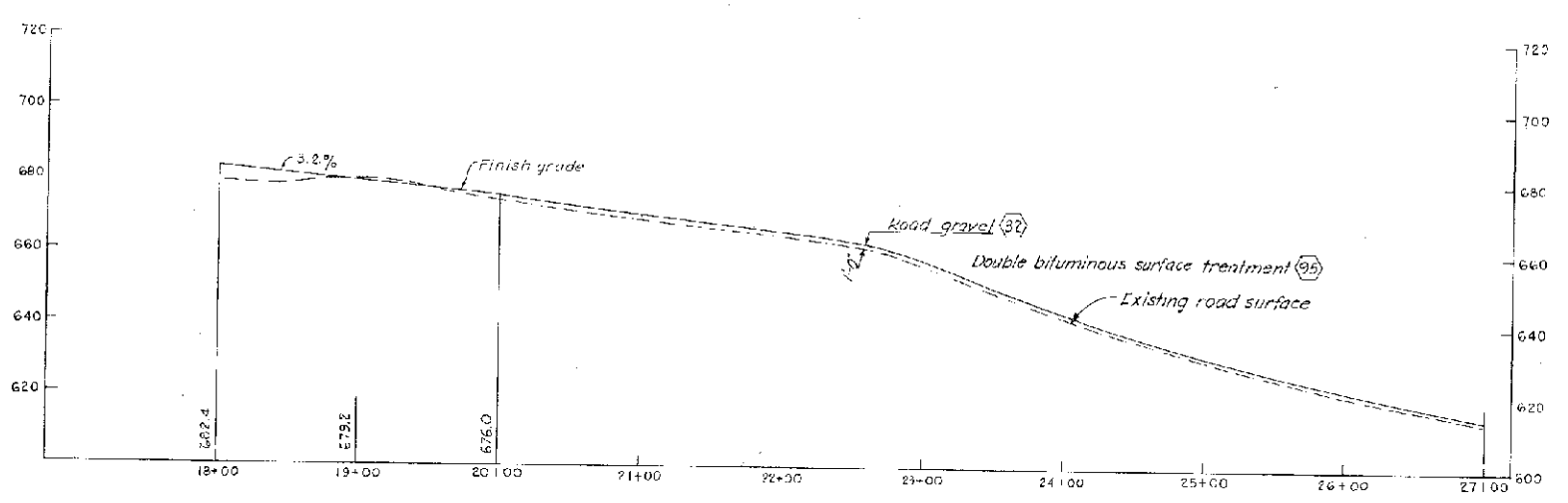
SHEET 94

CORPS OF ENGINEERS

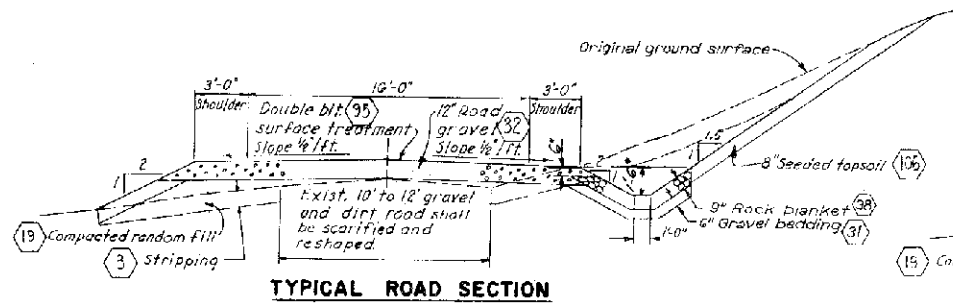
U. S. ARMY



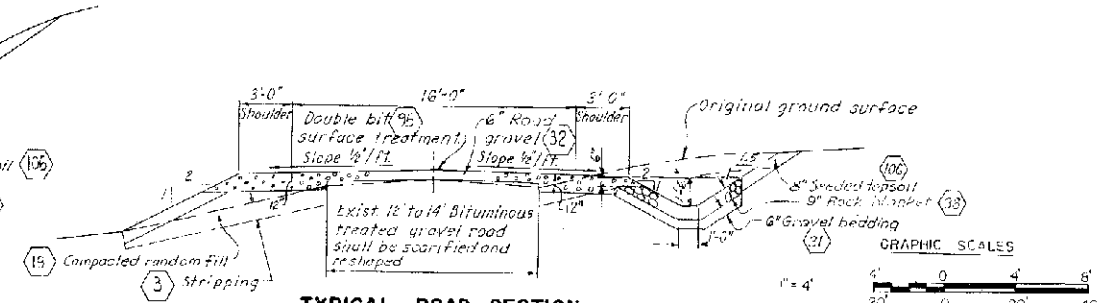
PLAN
SCALE 1"=50'



℄ PROFILE
SCALE: HORZ 1"=50'
VERT. 1"=20'



TYPICAL ROAD SECTION
STA. 20+00 TO STA. 45+95±
SCALE 1"=4'



TYPICAL ROAD SECTION
STA. 46+45± TO STA. 62+00
SCALE 1"=4'

GRAPHIC SCALES

1" = 4' 0 4' 8'
1" = 20' 20' 0 20' 40'
1" = 50' 50' 0 50' 100'

NOTES:
For general notes see sheet 94.
Figures in hexagons indicates item numbers under which payment will be made.
Stone walls will be removed where they interfere with work of road improvement, and will be paid for under item 3.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY J.F.H. | DR. BY J.F.H. | CK. BY

SUBMITTED: Reginald S. Hoyt Jr. CHIEF, CIVIL SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH
APPROVAL RECOMMENDED
CHIEF, P & R BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO. 2
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

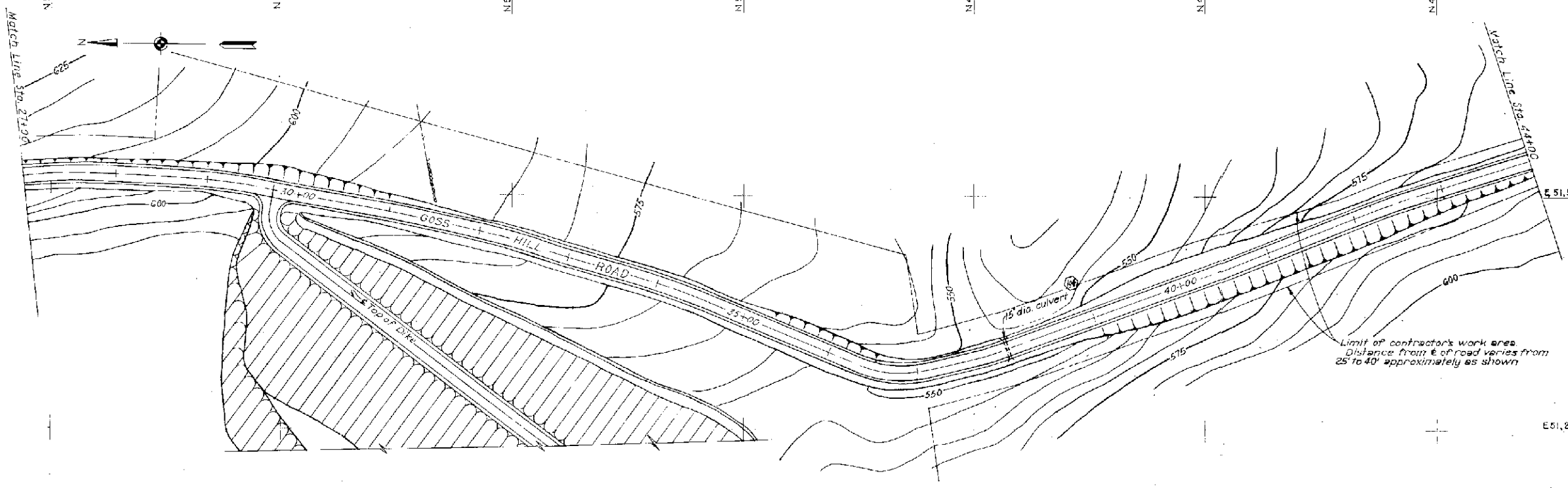
APPROVED: DATE MAR 1962
CHIEF, ENGINEERING DIVISION

SCALE: AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-1-5801
SHEET 95

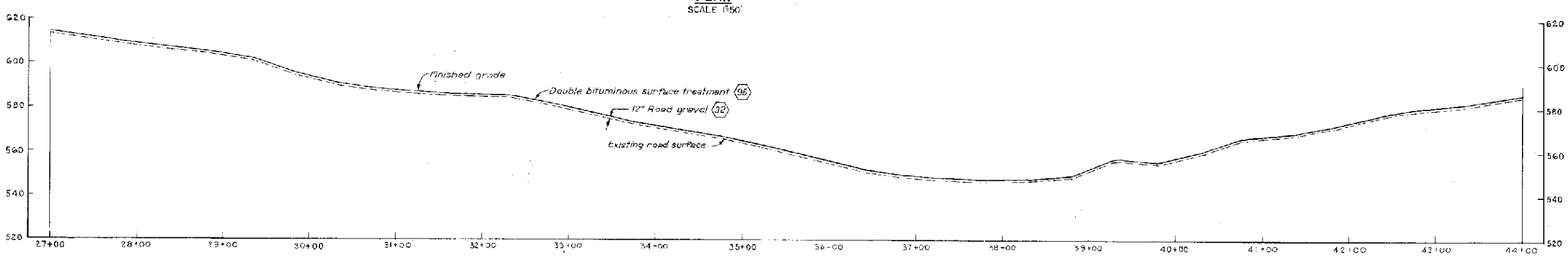
MODERN BLUE PRINT CO., BOSTON, MASS.

CORPS OF ENGINEERS

U.S. ARMY



PLAN
SCALE 1"=50'



℄ PROFILE
SCALE HORZ. 1"=50'
VERT. 1"=20'

NOTES:
For general notes see sheet 94.
For typical road sections see sheet 95.

GRAPHIC SCALES
1" = 20' 20' 0 20' 40'
1" = 50' 50' 0 50' 100'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.F.H. | DR. BY J.F.H. | CK. BY

SUBMITTED: Herbert P. Howe Jr. CHIEF, CIVIL DESIGN BRANCH

PROJECT ENGINEER

TECHNICAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED: CHIEF, E & D BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO.3
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

DATE MAR 1962

SCALE AS SHOWN | SPEC. NO. CIV ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5802

SHEET 86

CORPS OF ENGINEERS

U.S. ARMY

A B C D E F G H

N 49,250 E 51,750 N 49,000 E 52,000 N 48,750 E 52,250 N 48,500 E 52,500 N 48,250 E 52,750 N 48,000

N 47,750 E 52,300

Match Line Sta. 44+00

Exist. rd.

Existing gravel dirt road

Exist. rd.

Existing paved road

Transition

45+00

50+00

55+00

60+00

Limit of Contractor's Work Area. Distance from ℄ road varies from 25' to 40' approximately as shown

Sta. 62+00

Existing Bridge

Middle Branch Westfield River

PLAN

SCALE 1"=50'

Road gravel

Double bituminous surface treatment

50'± Transition

Finished grade

Road gravel (32)

Double bituminous surface treatment (95)

Existing mud surface

45+95 ℄

46+45 ℄

600 580 560 540 520 500 480 460 440 420 400

44+00 45+00 46+00 47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00 58+00 59+00 60+00 61+00 62+00

℄ PROFILE

SCALE: HORZ. 1"=50'
VERT. 1"=20'

NOTES:
For general notes see sheet 94.
For typical road sections see Sheet 95.
Contours shown are based on aerial survey

GRAPHIC SCALES

1"=20' 20' 0 20' 40'

1"=50' 50' 0 50' 100'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H. MacL | DR. BY D.L.W. | CK. BY WHK

SUBMITTED: Herbert D. Kinney, CHIEF, CIVIL SECTION

PROJECT ENGINEER

TECHNICAL RECOMMENDED: CHIEF, DESIGN BRANCH

ADMINISTRATIVE RECOMMENDED: CHIEF, R. & R. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GOSS HILL ROAD IMPROVEMENT
PLAN AND PROFILE NO. 4
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

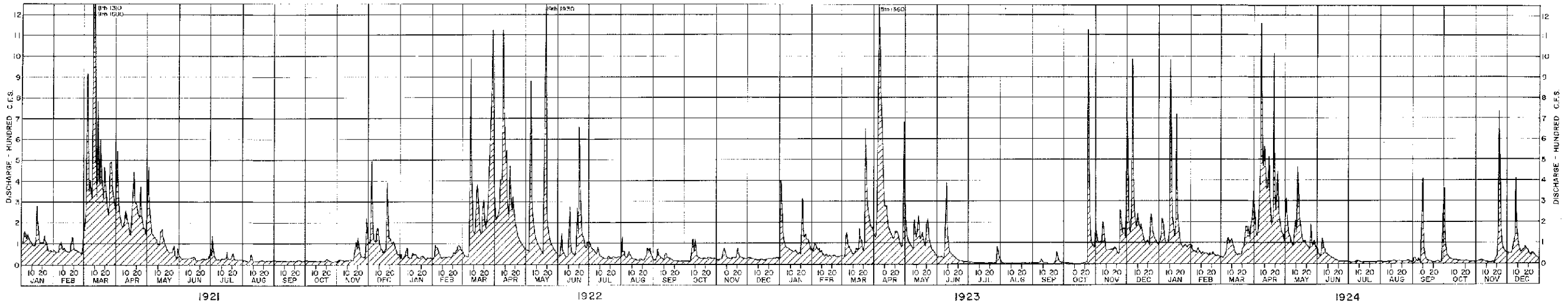
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 18-016-62-49

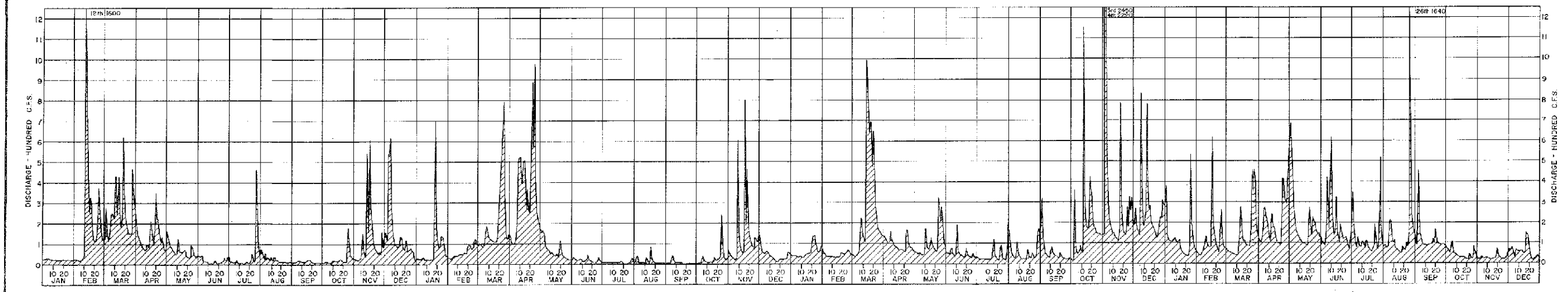
DRAWING NUMBER
CT-I-5803

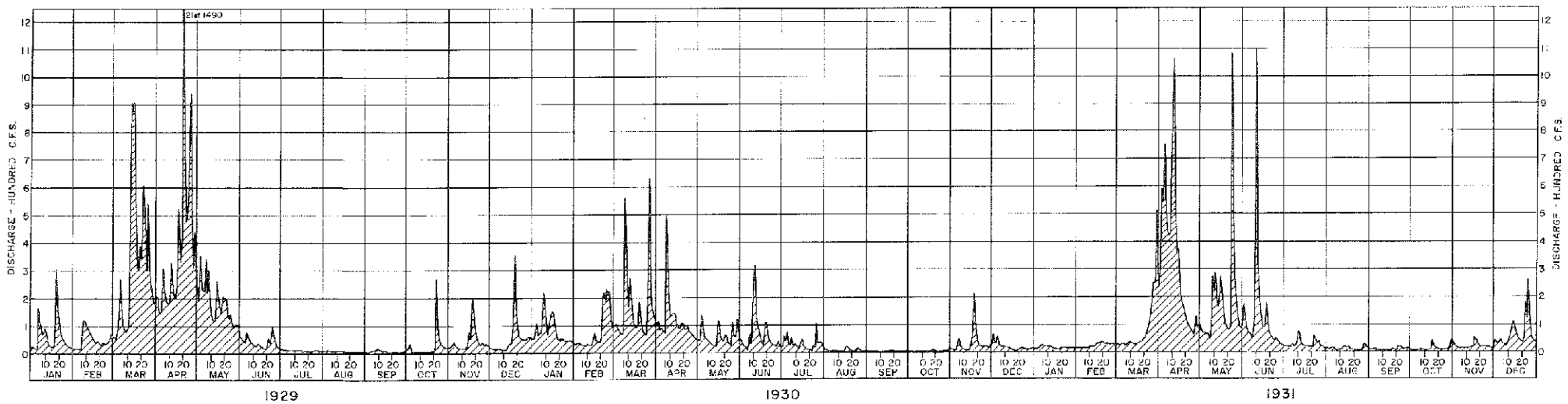
SHEET 97

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warranties but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY R.B. | TR. BY | CK. BY E.P.S.

SUBMITTED
CHIEF H.D.& R.D. SECTION

PROJECT ENGINEER

RECOMMENDED
CHIEF H.& R. BRANCH

APPROVED
CHIEF ENGINEERING DIVISION

DATE May 17, 1956

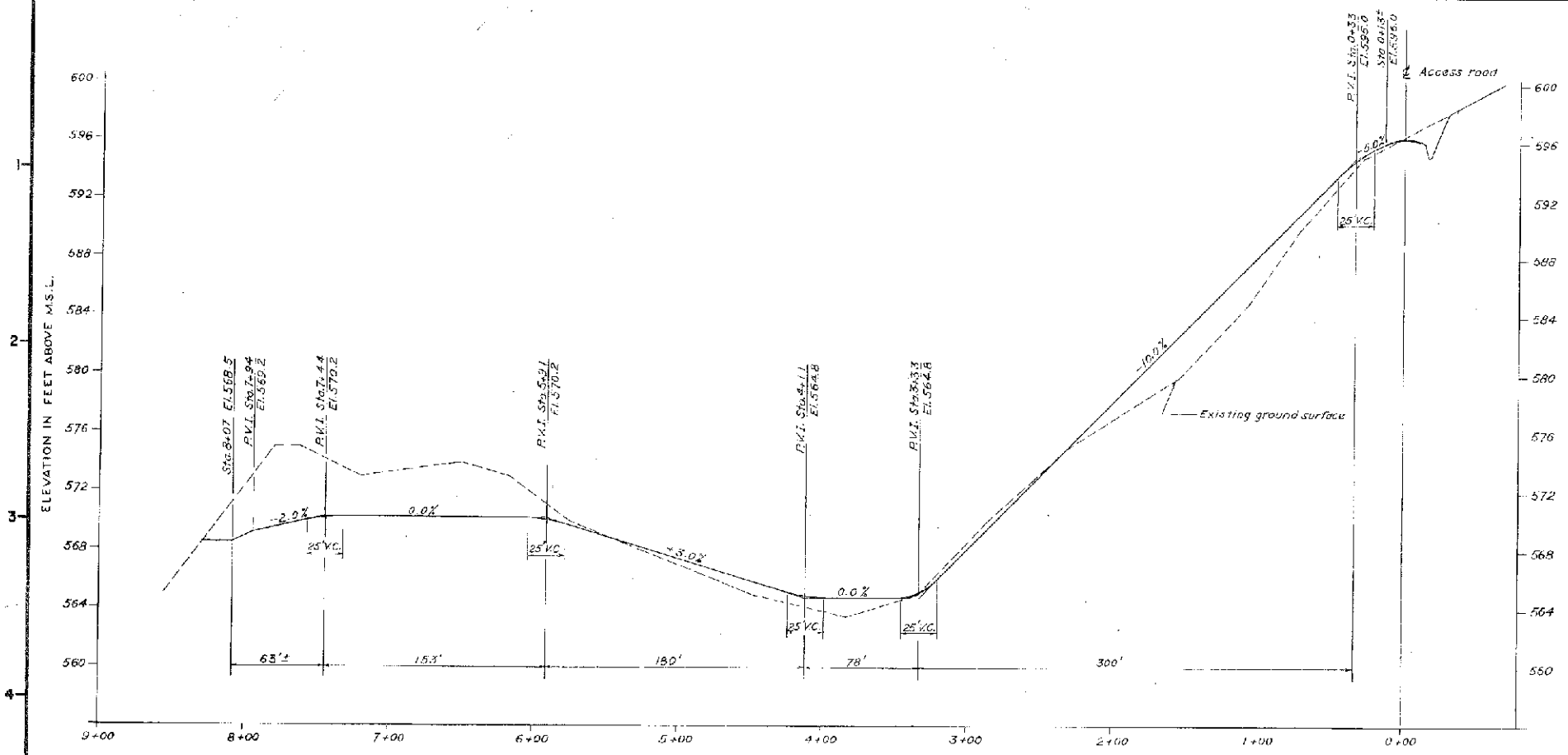
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE RESERVOIR
HYDROGRAPHS NO. 2
MIDDLE BRANCH WESTFIELD RIVER, MASS.

SCALE AS SHOWN | SPEC. NO. CIV. ENG-19-016-56-142

DRAWING NUMBER
CT 1-5727

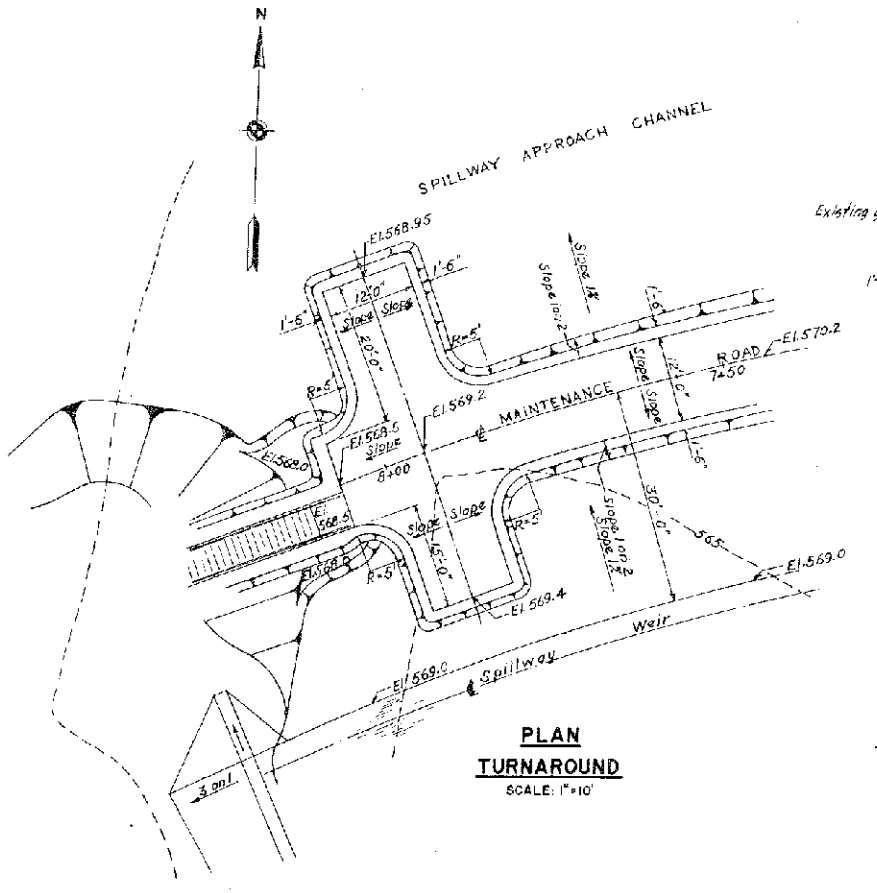
SHEET 4

CORPS OF ENGINEERS — U.S. ARMY

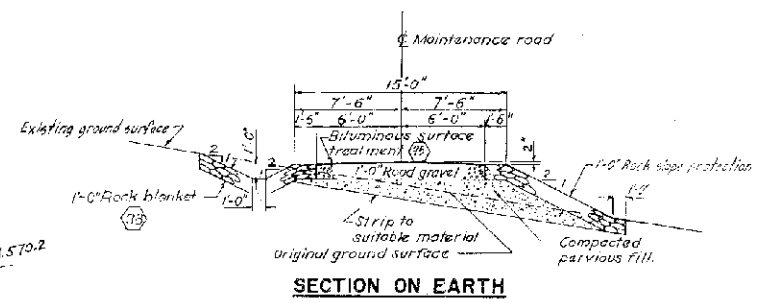


PROFILE ALONG ℄ MAINTENANCE ROAD

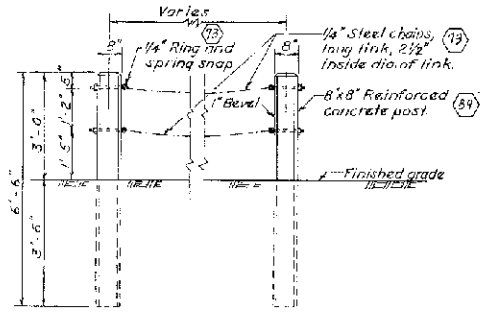
SCALES: HOR. 1"=40'
VERT. 1"=4'



PLAN
TURNAROUND
SCALE: 1"=10'



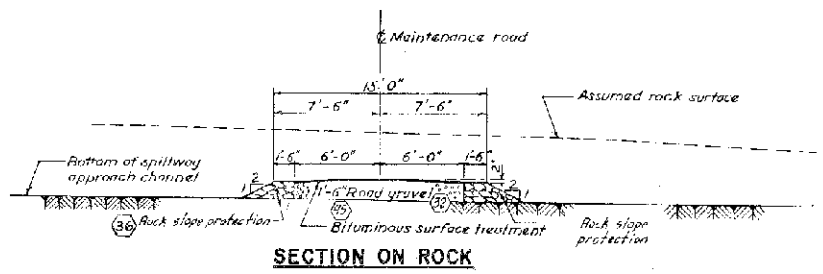
SECTION ON EARTH



CHAIN BARRIER

(For location see Sheet No. 31)

SCALE: 1/2"=1'-0"



SECTION ON ROCK

TYPICAL SECTIONS OF MAINTENANCE ROAD

SCALE: 1"=5'

NOTES:

Elevations refer to mean sea level datum.
Figures in hexagons indicate item numbers under which payment will be made.
For plan of Maintenance Road see Sheet No. 31.

GRAPHIC SCALES

1"=40'	40'	0	40'	80'
1"=4'	4'	0	4'	8'
1"=10'	10'	0	10'	20'
1"=5'	5'	0	5'	10'
1/2"=1'-0"	2'	0	2'	4'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY P.H. | DR. BY B.N. | CK. BY J.H.

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
MAINTENANCE ROAD
PROFILE, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVAL RECOMMENDED: CHIEF, E & D BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: MARCH 1962

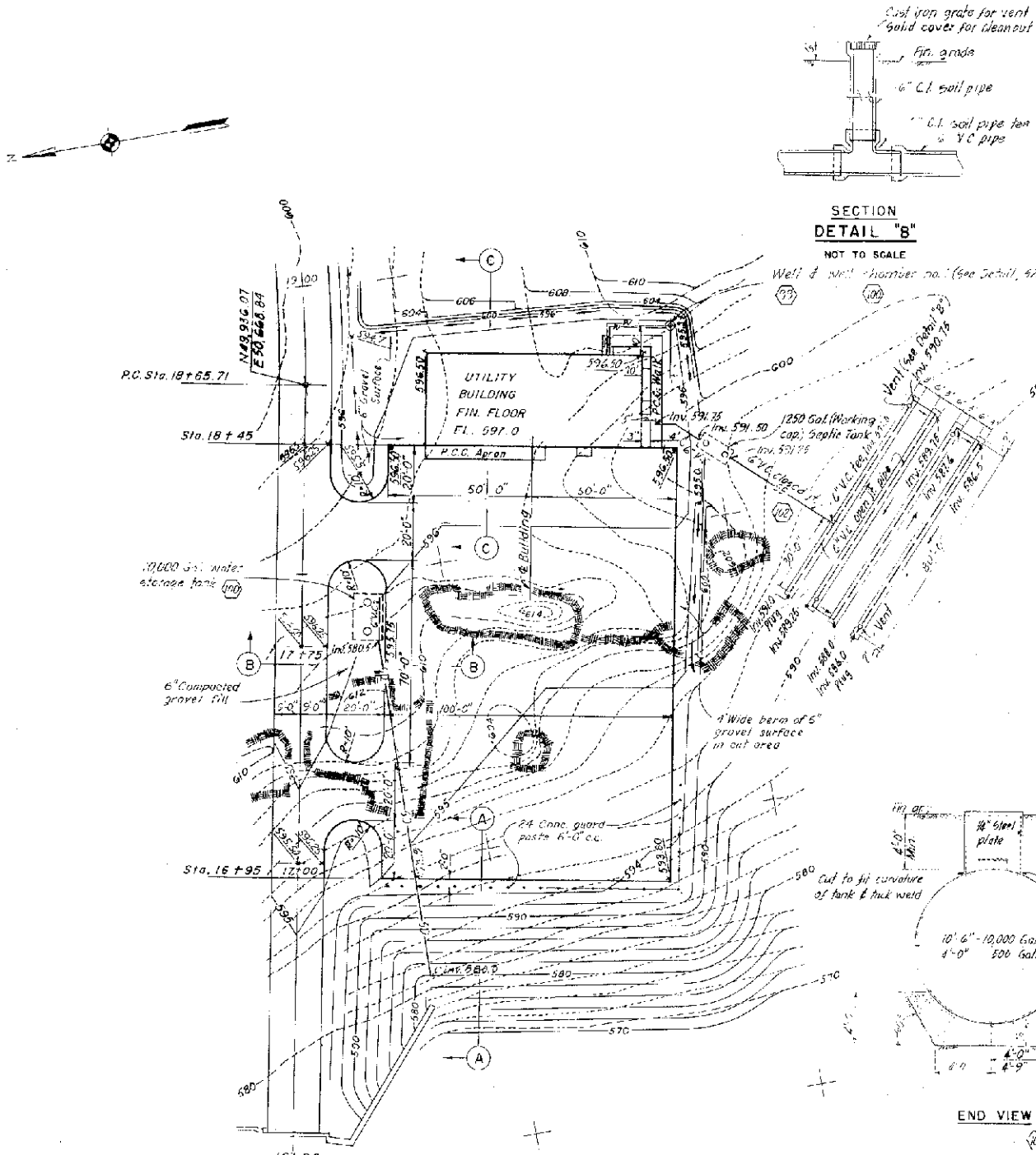
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5804

SHEET 88

MODERN BLUE PRINT CO., BOSTON, MASS.

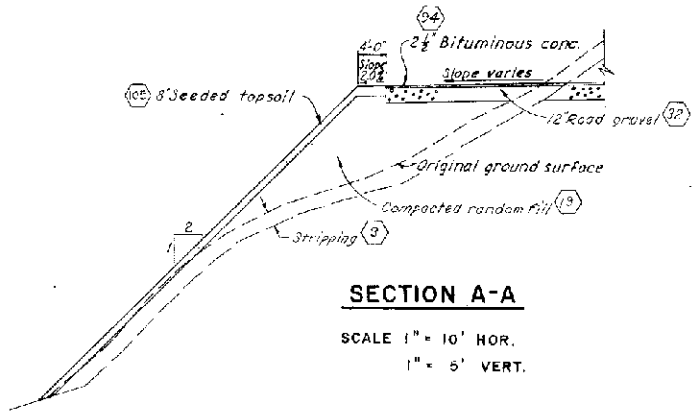
CORPS OF ENGINEERS — U. S. ARMY



SITE PLAN

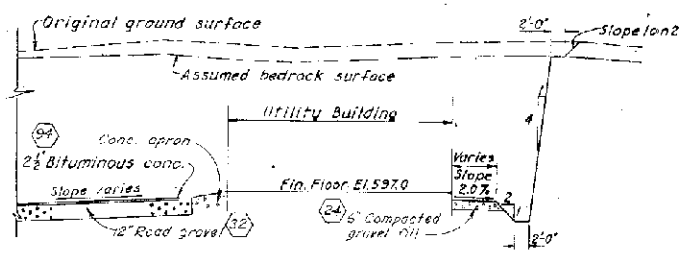
SCALE 1" = 20'

SECTION
DETAIL "B"
NOT TO SCALE



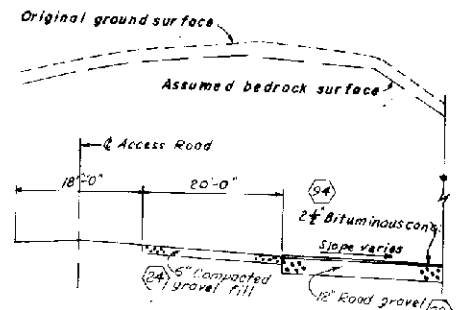
SECTION A-A

SCALE 1" = 10' HOR.
1" = 5' VERT.



SECTION C-C

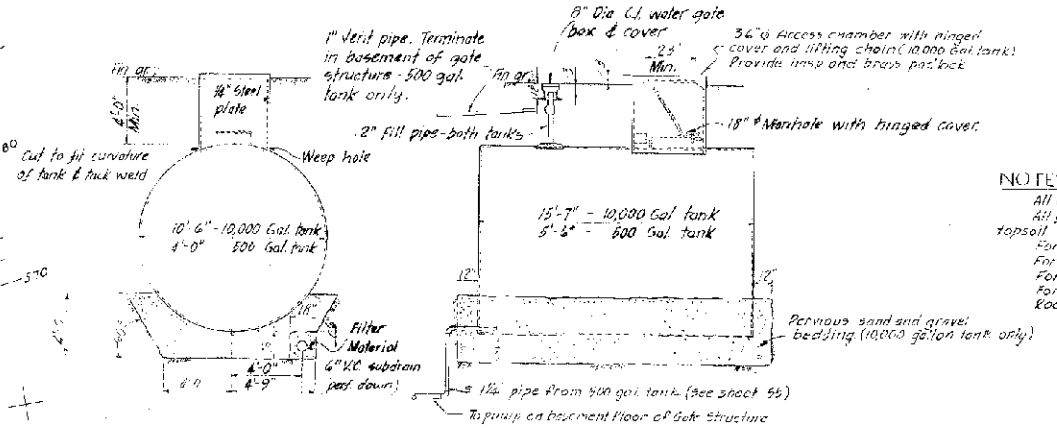
SCALE 1" = 10' HOR.
1" = 5' VERT.



SECTION B-B

SCALE 1" = 10' HOR.
1" = 5' VERT.

LEGEND (THIS SHEET ONLY)		
NEW	EXISTING	DESCRIPTION
596.50		Elevations
600	580	Contours
		Paved areas
		Grade to drain
		Building
		Ledge
SD		Storm Drain (Subdrain Outlet)
W		Water Line
S		Sanitary Sewer Line

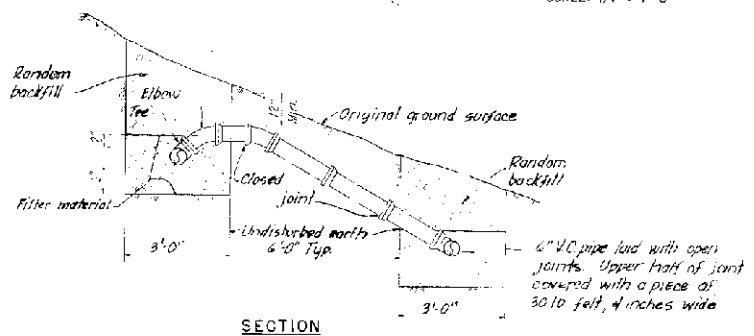


(102) WATER STORAGE TANKS

SCALE: 1/4" = 1'-0"

NOTES:

All elevations refer to Mean Sea Level Datum.
All graded areas, except rock or ledge, shall have 8" seeded topsoil unless otherwise indicated.
For guard post details see Sheet 29.
For concrete walk detail see Sheet 30.
For painting requirements of water tanks see specifications.
For location of 500 gallon water tank see Sheet 55.
Rock excavation will be paid for under Item No. 6.



SECTION

(22) TYPICAL LEACHING TRENCH SYSTEM

NOT TO SCALE

For locations and pipe inverts, see Site Plan this sheet and Sheet 106.

GRAPHIC SCALES

1" = 5' — 5 0 5 10'
1" = 10' — 10' 0 10' 20'
1" = 20' — 20' 0 20' 40'
1/4" = 1'-0" — 4' 0 4' 8'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.F.H. | DR. BY J.C.B. | CK. BY

SUBMITTED: CHIEF, DIVISION

PROJECT ENGINEER

RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED: CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
SITE PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

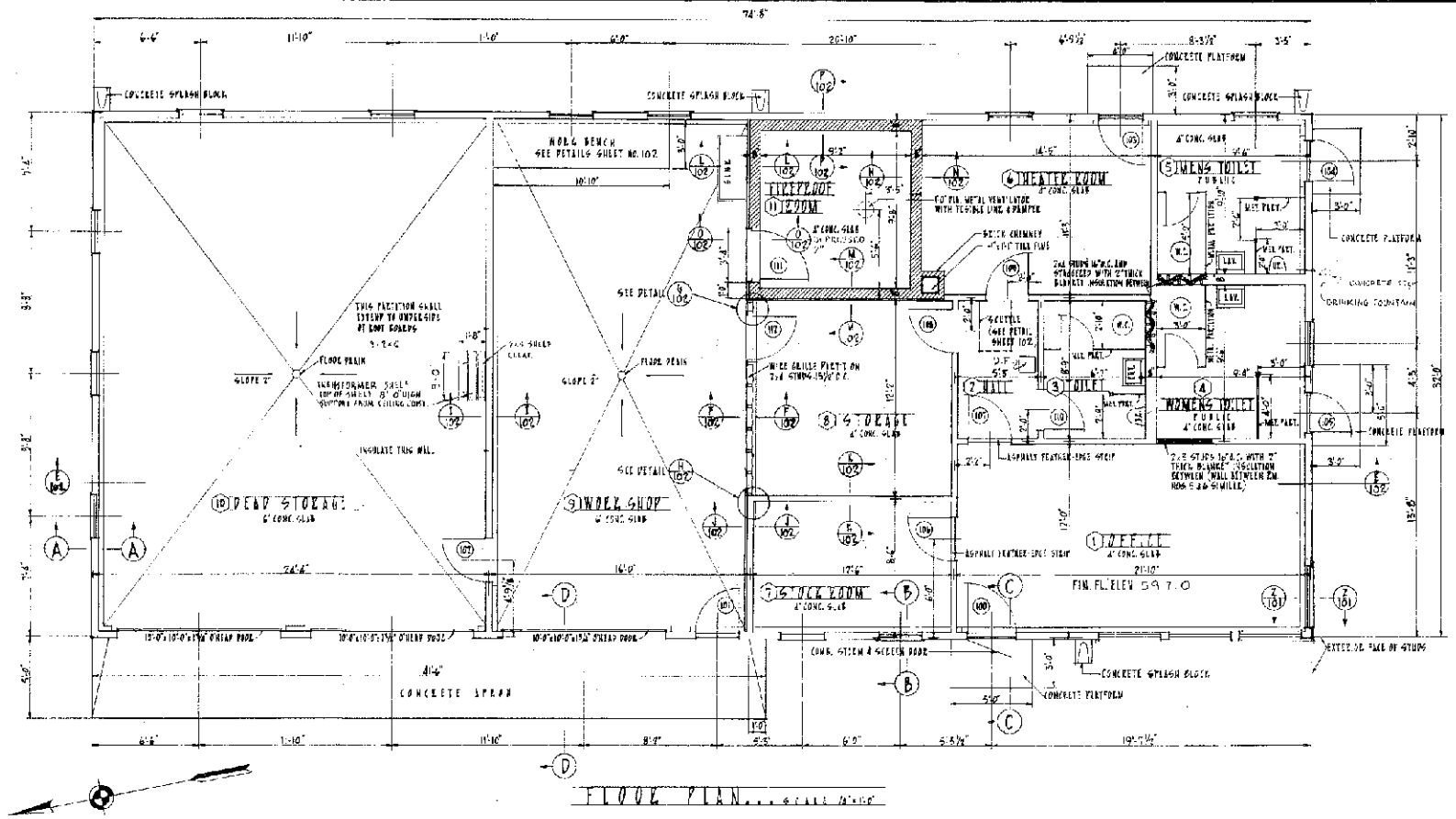
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-1-5805

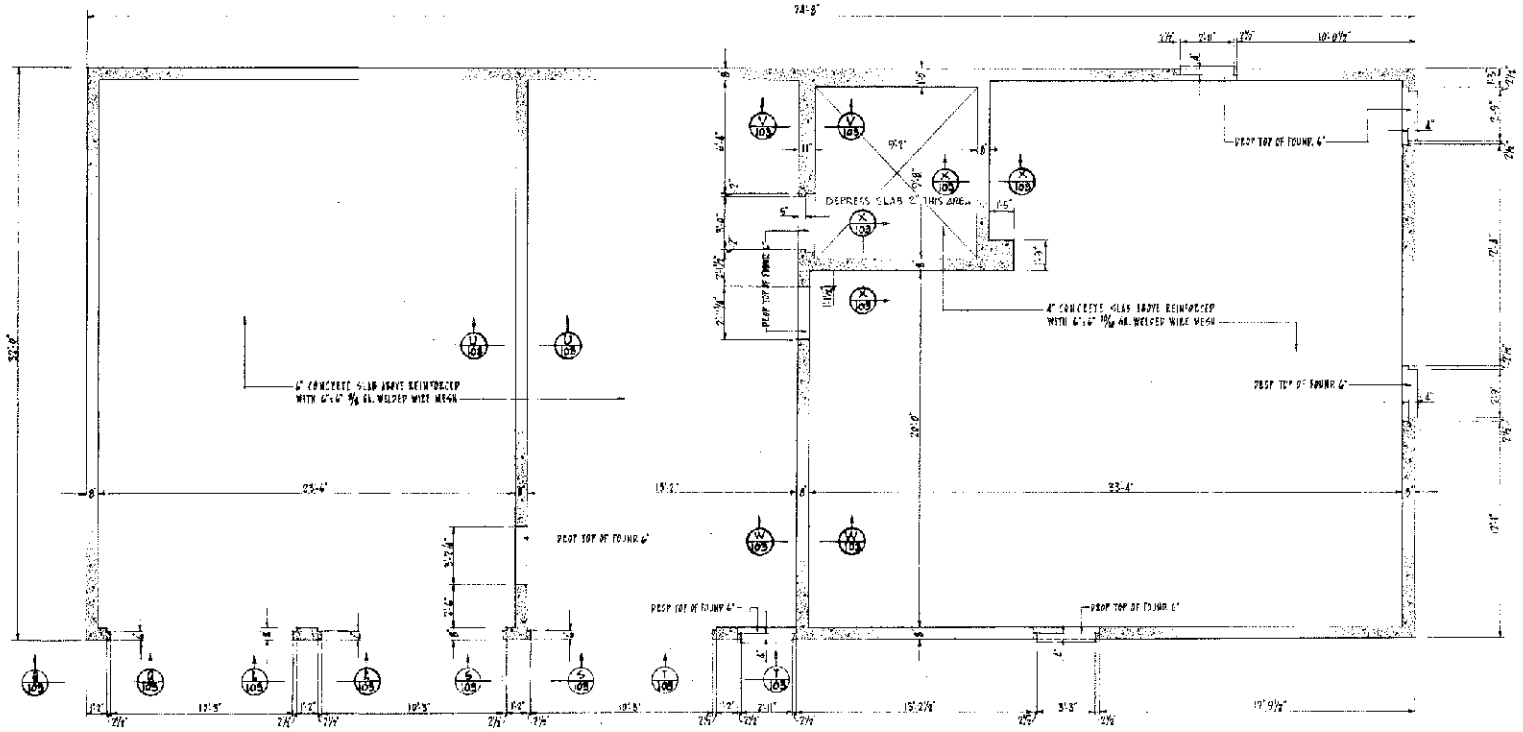
SHEET 59

CORPS OF ENGINEERS

U. S. ARMY



FLOOR PLAN... SCALE 1/4"=1'-0"



FOUNDATION PLAN... SCALE 1/4"=1'-0"

GRAPHIC SCALES

1/8" = 1'-0"

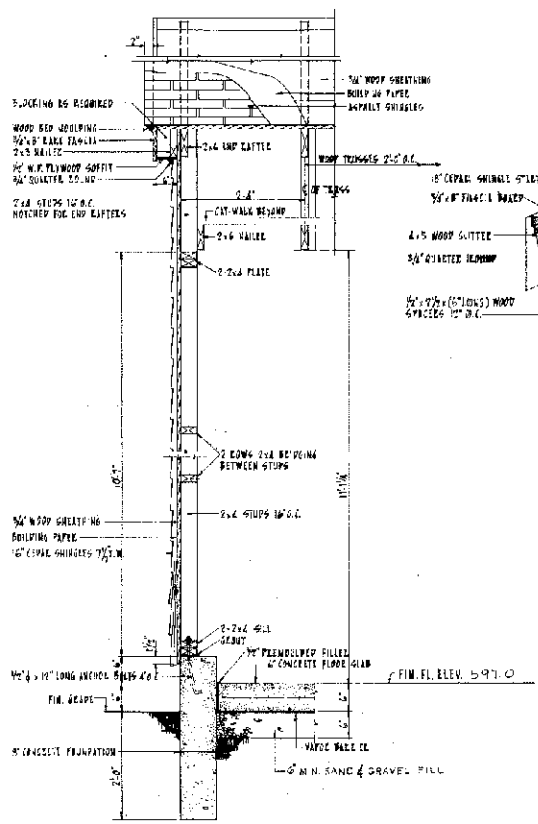
3/4" = 1'-0"

1 1/2" = 1'-0"

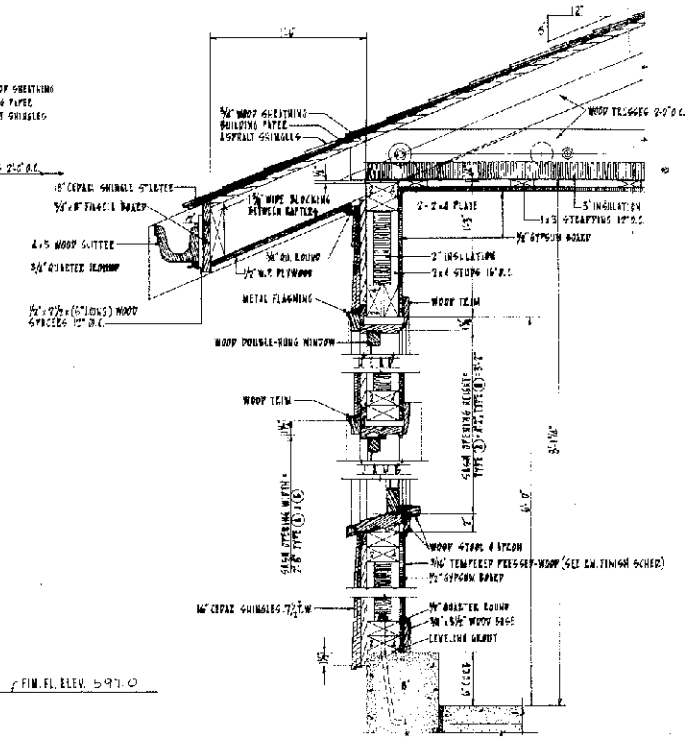
INSULATION NOTES

① INSULATE ALL EXTERIOR WALLS EXCEPT IN RM. NOS. 10 & 11.
② INSULATE WALL BETWEEN RM. NO. 9 & RM. NO. 8 TO CEILING HEIGHT OF WOOD SHAFT.
③ INSULATE ALL CEILINGS EXCEPT IN RM. NOS. 10 & 11.
④ INSULATE WALLS AND GROUND BETWEEN RM. NO. 1 & RM. NO. 4, RM. NO. 3 & RM. NO. 4, RM. NO. 2 & RM. NO. 5, RM. NO. 5 & RM. NO. 6

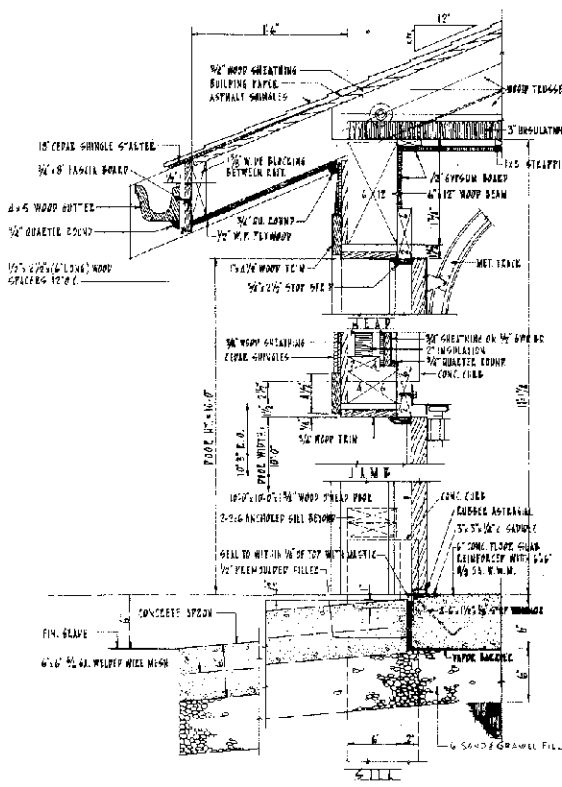
ALL ITEMS ON THIS SHEET ARE TO BE PAID FOR UNDER ITEMS NO. 96.



SECTION (A)... SCALE 1/4"=1'-0"



SECTION (B)... SCALE 1 1/2"=1'-0"
TYPICAL FOR TYPES (A) & (B) WINDOWS



SECTION (D) TYPICAL OVERHEAD DOOR... SCALE 1 1/2"=1'-0"

SECTION (C) TYPICAL EXTERIOR DOOR... SCALE 1 1/2"=1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. | DR. BY J.S. | CK. BY J.S.

SUBMITTED: CHIEF, ARCH. SECTION

PROJECT ENGINEER

APPROVED: CHIEF, ENGINEERING BRANCH

APPROVAL RECOMMENDED: CHIEF, P. B. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
PLANS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: [signature] DATE: NOV 1962

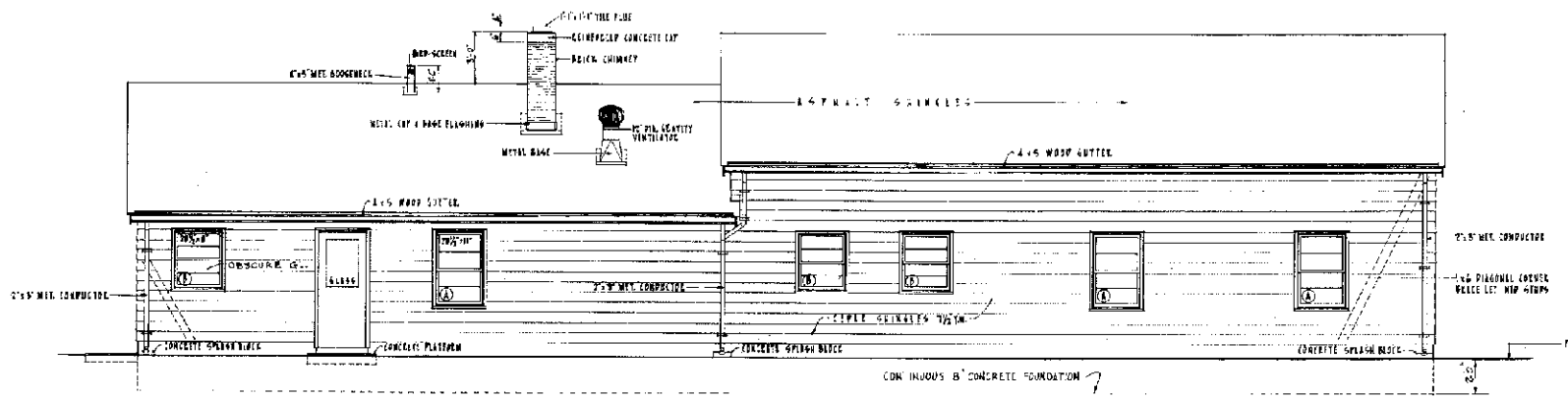
CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

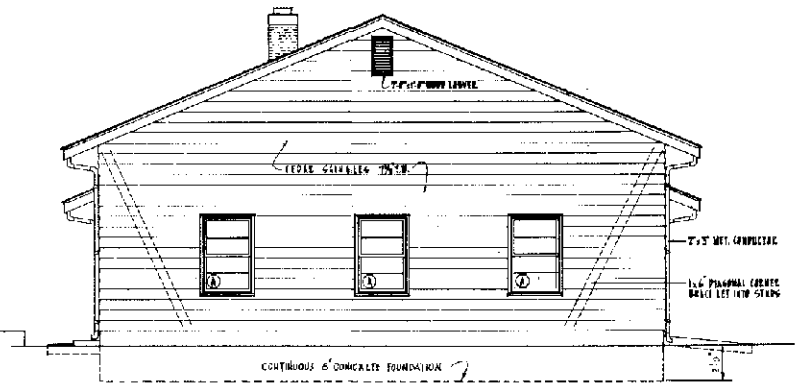
DRAWING NUMBER
CT-1-5806

SHEET 100

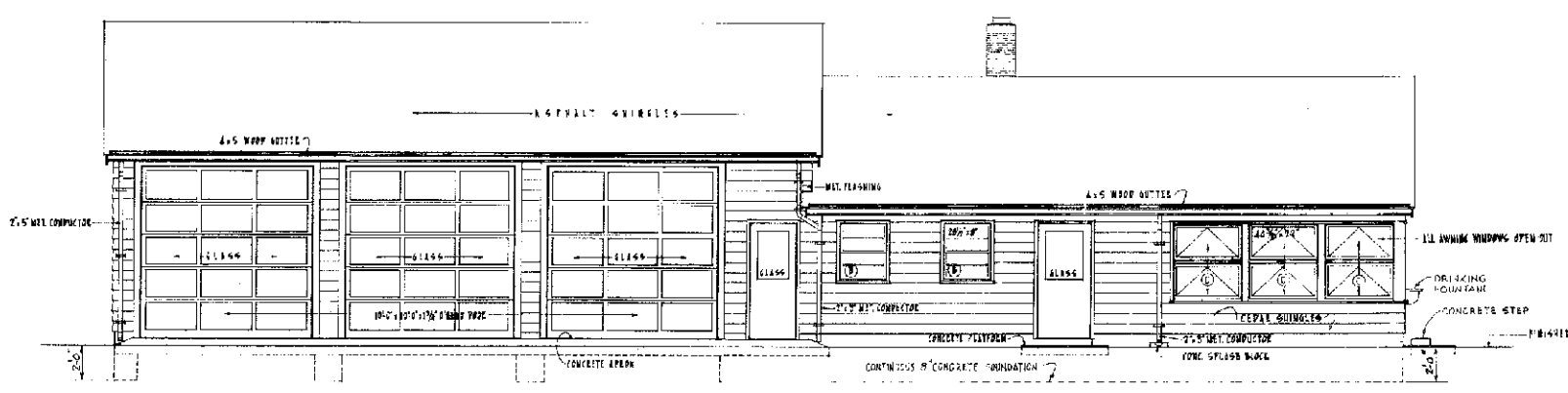
CORPS OF ENGINEERS — U. S. ARMY



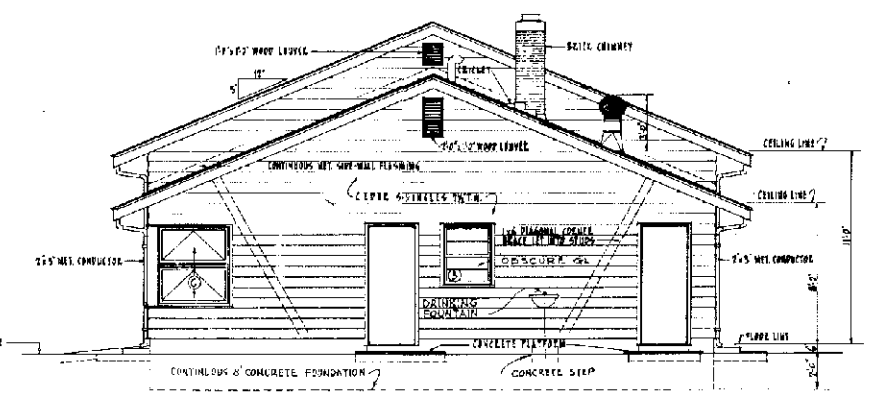
EAST ELEVATION



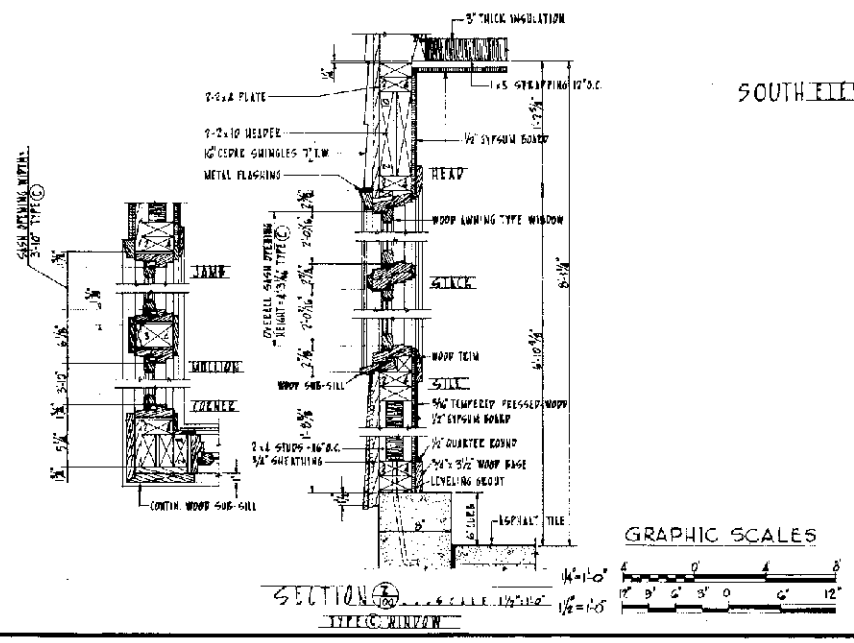
NORTH ELEVATION



WEST ELEVATION



SOUTH ELEVATION



REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. DR. BY J.G. CK. BY

SUBMITTED: Chief, Arch. Section

PROJECT ENGINEER:

APPROVAL RECOMMENDED: Chief, Design Branch

APPROVAL RECOMMENDED: Chief, Survey Branch

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
ELEVATIONS AND DETAILS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED: Chief, Engineering Division

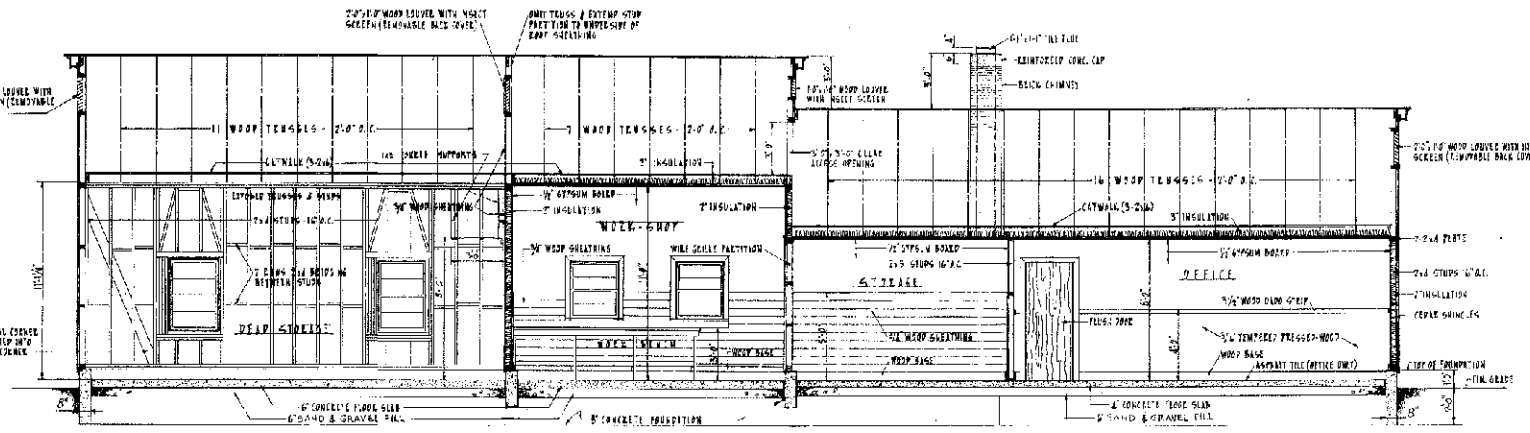
DATE: MARCH 1962

SCALE AS SHOWN — SPEC. NO. CIV ENG. 19-016-62-49

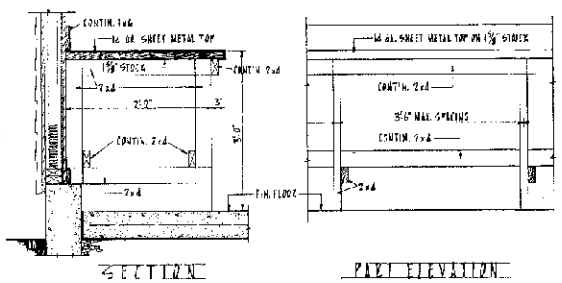
DRAWING NUMBER: CT-1-5807

SHEET 101

CORPS OF ENGINEERS — U. S. ARMY

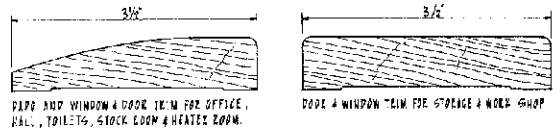


SECTION ... SCALE 1/4"=1'-0"



SECTION — PART ELEVATION

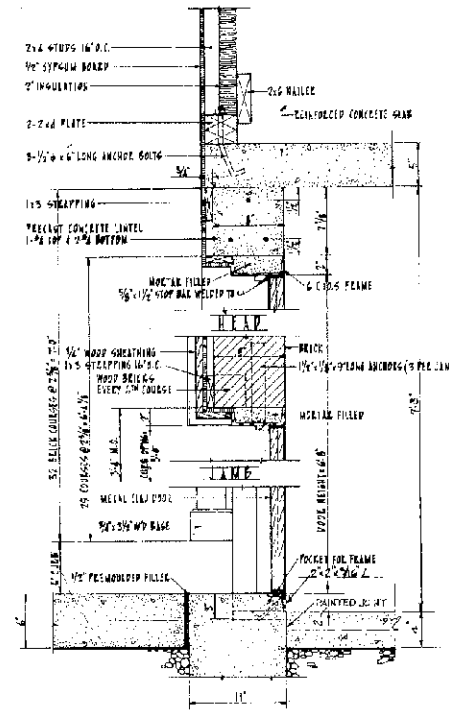
DETAILS OF WORK BENCH ... SCALE 3/4"=1'-0"



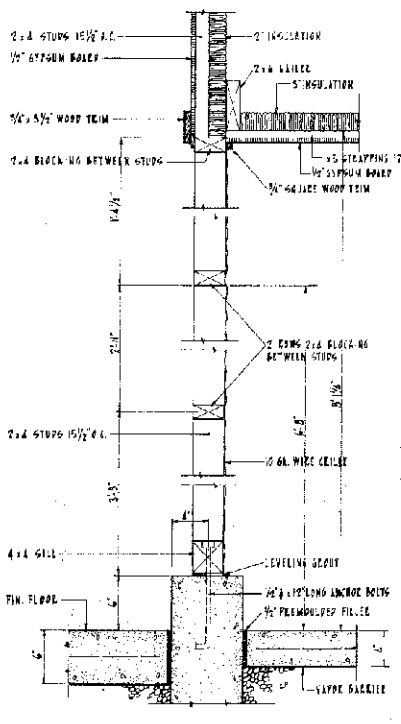
PAPER BOX WINDOW & DOOR TRIM FOR OFFICE, HALL, TOILETS, STOCK ROOM & HEATER ROOM.

DOOR & WINDOW TRIM FOR STORAGE & WORK SHOP

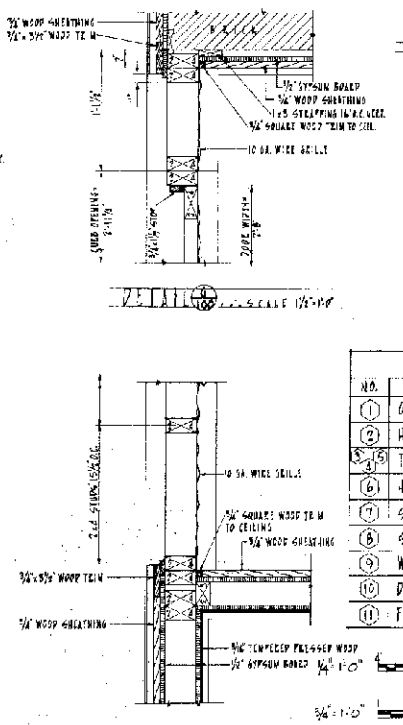
FULL SIZE WINDOW, DOOR & DADO TRIM



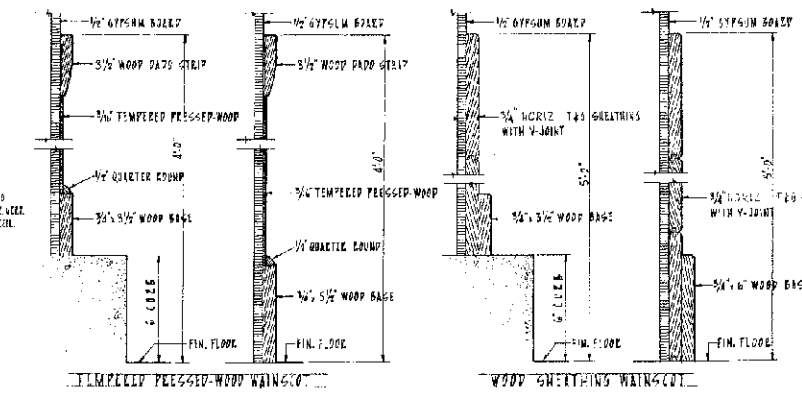
SECTION ... SCALE 1"=1'-0"



SECTION ... SCALE 1"=1'-0"

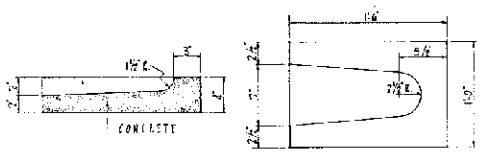


DETAIL ... SCALE 1"=1'-0"

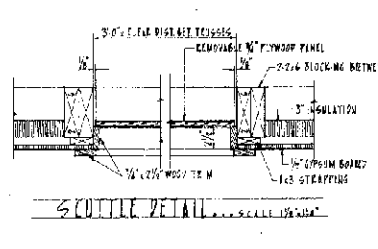


TEMPERED PEGGED-WOOD WAINSCOT — WOOD SHEATHING WAINSCOT

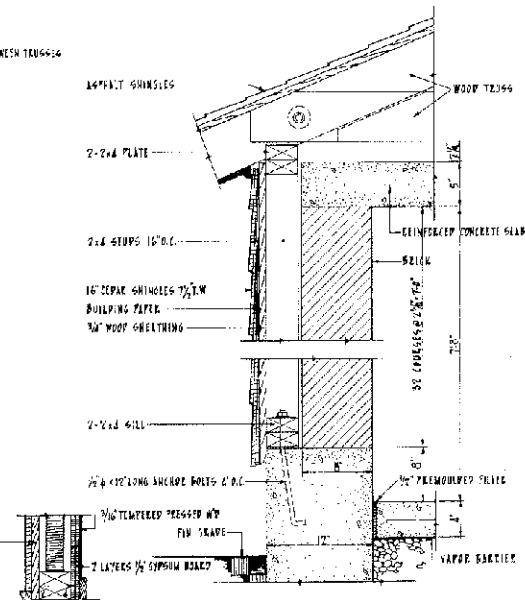
WAINSCOT DETAILS ... SCALE 3"=1'-0"



SPLASH BLOCK ... SCALE 1 1/2"=1'-0"



SCUTTLE DETAIL ... SCALE 1"=1'-0"



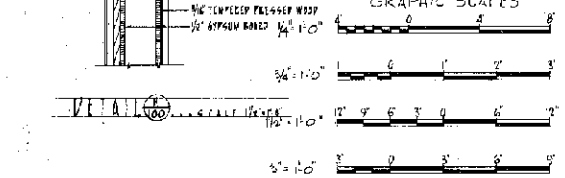
ROOM FINISH SCHEDULE

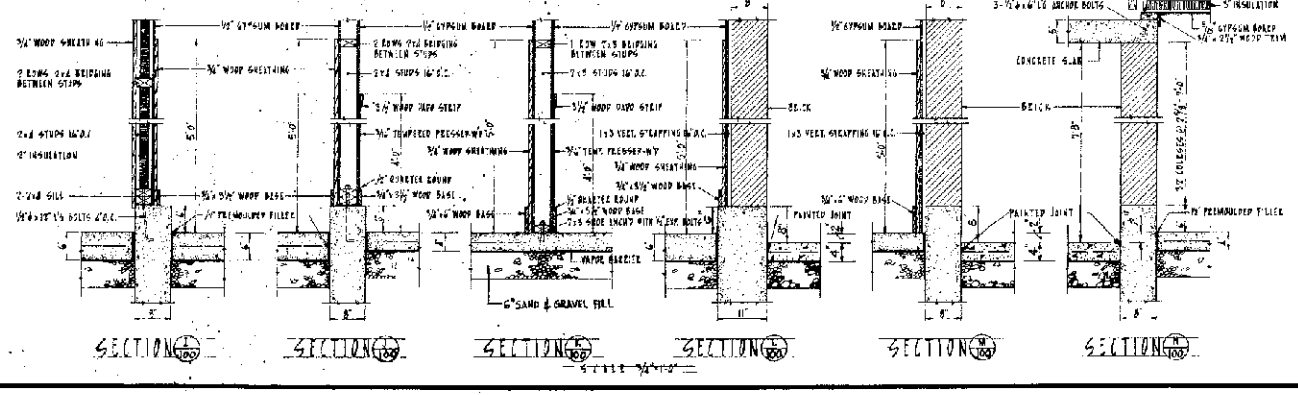
NO.	ROOM	FLOOR	BASE	WAINSCOT	WALLS	CEILING	TRIM	REMARKS
(1)	OFFICE	ASPHALT TILE	WOOD	3/4" TEMPERED PEGGED-WOOD 4'-0" HIGH	1/2" GYPSUM BOARD	1/2" GYPSUM BOARD	WOOD	
(2)	HALL	CONCRETE	"	"	"	"	"	
(3) (4) (5)	TOILETS	"	"	"	1/2" GYPSUM BOARD SEE REMARKS	1/2" GYPSUM BOARD SEE REMARKS	"	2 LAYERS 1/2" GYPSUM BOARD WALLS & CEILINGS, EMOBS 4 & 5
(6)	HEATER ROOM	"	"	"	5/8" FIRE RATED GYPSUM BOARD	5/8" FIRE RATED GYPSUM BOARD	"	
(7)	STOCK ROOM	"	"	"	1/2" GYPSUM BOARD	1/2" GYPSUM BOARD	"	
(8)	STORAGE	"	"	3/4" T & G HORIZ WOOD SHEATHING 5'-0" HIGH	"	"	"	
(9)	WORK SHOP	"	"	"	"	"	"	
(10)	DEAD STORAGE	"			EXPOSED CINDER BLOCK WALLS & 1/2" I.C. SHEATHING INTERIOR WALL	EXPOSED CONCRETE	WOOD DOOR JAMB	HORIZONTAL SHEATHING FOR INTERIOR WALL SHALL EXTEND 4'-0" ON EXPOSED CINDER BLOCK WALLS
(11)	FIREPROOF RM.	"			EXPOSED BRICK	EXPOSED CONCRETE		

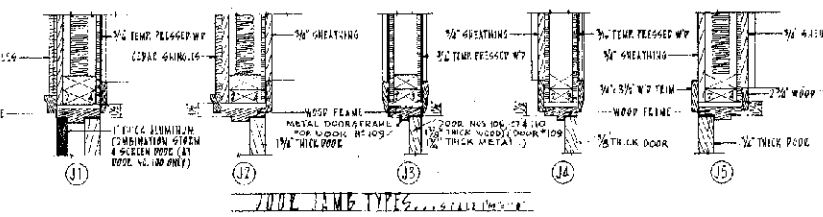
DOOR SCHEDULE

NO.	TYPE	SIZE	MATERIAL	JAMB TYPE	THRESHOLD	REMARKS
(100)	A	3'-0" x 6'-8" x 3/4"	WOOD	J	METAL	WITH FILM, COMB. STORM & SCREEN DOOR
(101)	B	2'-8" x 6'-8" x 1 3/8"	"	J5	METAL	
(102)	S	2'-6" x 6'-8" x 1 3/8"	"	J5		
(103)	S	2'-6" x 6'-8" x 1 3/8"	"	J1	METAL	
(104)	C	2'-6" x 6'-8" x 1 3/8"	"	J6	METAL	
(105)	C	2'-6" x 6'-8" x 1 3/8"	"	J6	METAL	
(106)	P	2'-8" x 6'-8" x 1 3/8"	"	J3		
(107)	E	2'-8" x 6'-8" x 1 3/8"	"	J3		INSIDE OUT
(108)	P	2'-8" x 6'-8" x 1 3/8"	"	J3		
(109)	F	2'-8" x 6'-8" x 1 3/4"	METAL	J3		GLASS 1/4" WIRE DOOR & FRAME WITH GLASS & LOUVER
(110)	E	2'-6" x 6'-8" x 1 3/8"	WOOD	J3		
(111)	-	3'-0" x 6'-8" x 1 3/4"	MET.-CLAD	SEE SCHED.	METAL	GLASS 1/4" WIRE DOOR WITH CHAIN LINK ROLLING GRILL
(112)	E	2'-8" x 6'-8" x 1 3/8"	WOOD	SEE DET.		

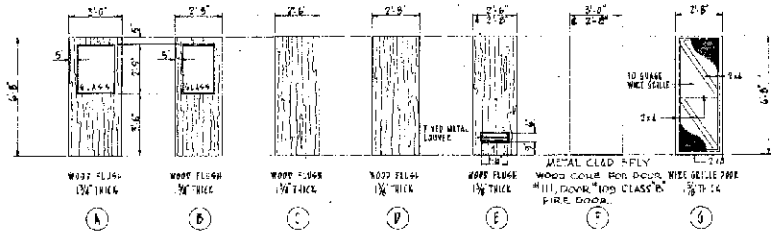
GRAPHIC SCALES







DOOR JAMB TYPES ... SCALE 1"=1'-0"



DOOR TYPES ... SCALE 1"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. | DR. BY J.S. | CK. BY

SUBMITTED: CHIEF, CIVIL BRANCH

RECOMMENDED: CHIEF, ENGINEERING SECTION

APPROVAL RECOMMENDED: CHIEF, CIVIL BRANCH

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: MARCH, 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

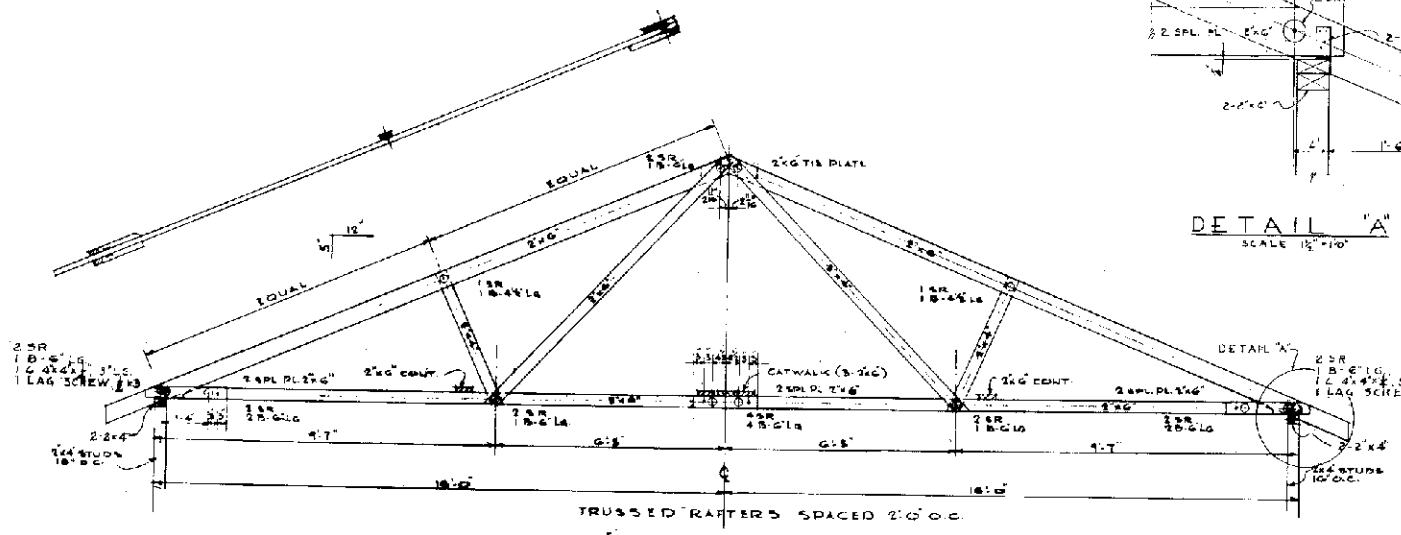
SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-I-5808

SHEET 102

CORPS OF ENGINEERS

U. S. ARMY



ELEVATION



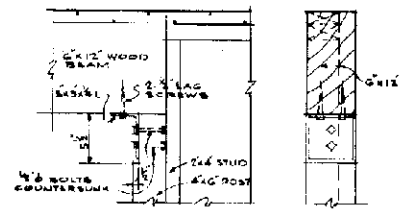
NOTE:
USE 2¼" SPL T RINGS AS MFG. BY TIMBER ENGINEERING CO. OR EQUAL.
⅝" ϕ MACHINE BOLTS.
2"x2"x⅛" PLATE WASHERS

TRUSSED RAFTER DETAILS

SCALE ½" = 1'-0"

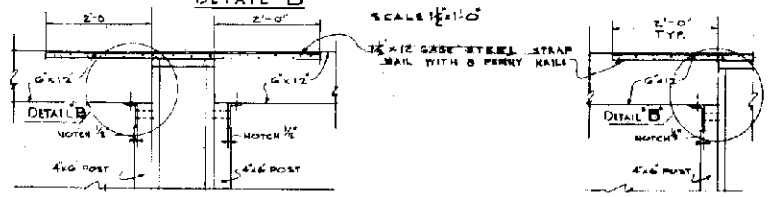
DETAIL "A"

SCALE 1½" = 1'-0"



DETAIL "B"

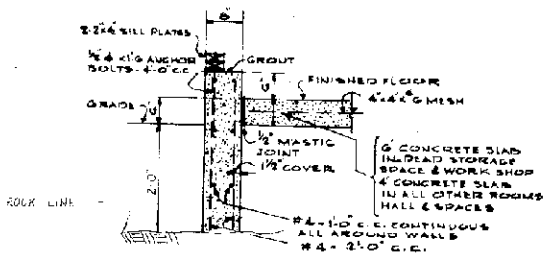
SCALE 1½" = 1'-0"



ELEVATION

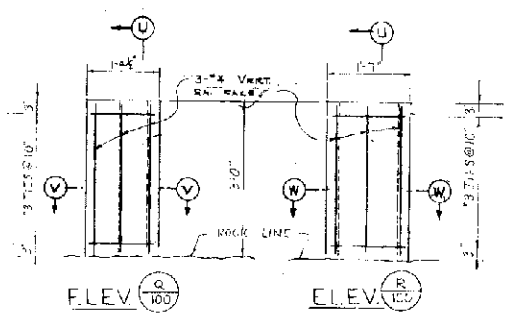
SCALE ¾" = 1'-0"

WOOD BEAM DETAILS OVER OVERHEAD TYPE DOORS

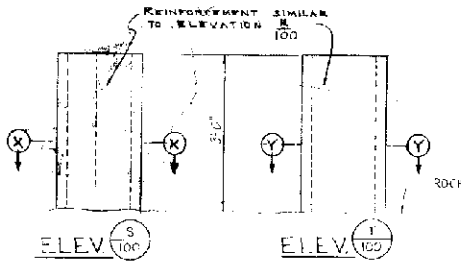


TYPICAL EXTERIOR 8" WALL

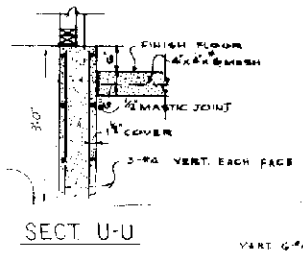
SCALE ¾" = 1'-0"



ELEV. (Q/100) ELEV. (R/100)



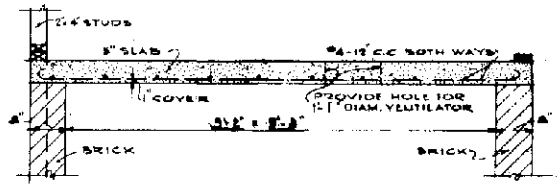
ELEV. (S/100) ELEV. (T/100)



SECT. U-U

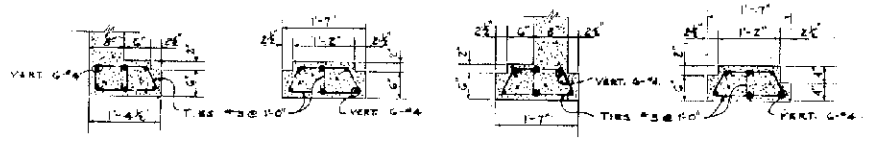
DETAIL OF PIERS AT OVERHEAD TYPE DOORS

SCALE ¾" = 1'-0"



FIREPROOF ROOM CEILING

SCALE ¾" = 1'-0"

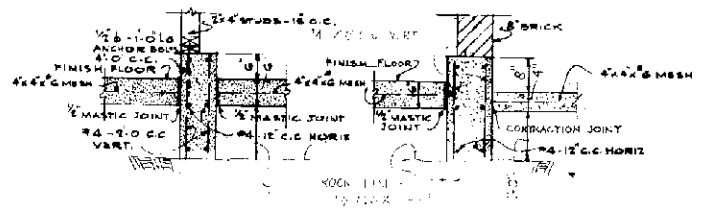


SECT. V-V SECT. W-W SECT. X-X SECT. Y-Y

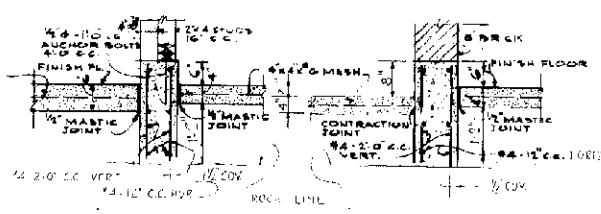
SCALE ¾" = 1'-0"

NOTE:

ALL FLOOR SLABS TO BE REINFORCED WITH 4"x4"x6 MESH WELDED FABRIC AND TO BE CUT WHEREVER CONTRACTION JOINT OCCURS.



SECT. (U/100) SECT. (Y/100)



SECT. (W/100) SECT. (X/100)

SCALE ¾" = 1'-0"

GRAPHIC SCALES

1½" = 1'-0"

¾" = 1'-0"

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DET. BY H.W.	DR. BY F.C.	CK. BY ERR

SUBMITTED: CHIEF, STRUCT. SECTION

PROJECT ENGINEER

PERSONAL RECOMMENDATION CHIEF, DESIGN BRANCH

APPROVED AND RECOMMENDED CHIEF, E & A BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
STRUCTURAL DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED DATE MARCH, 1962

CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN | SPEC. NO. CIV ENG 19-016 62-48

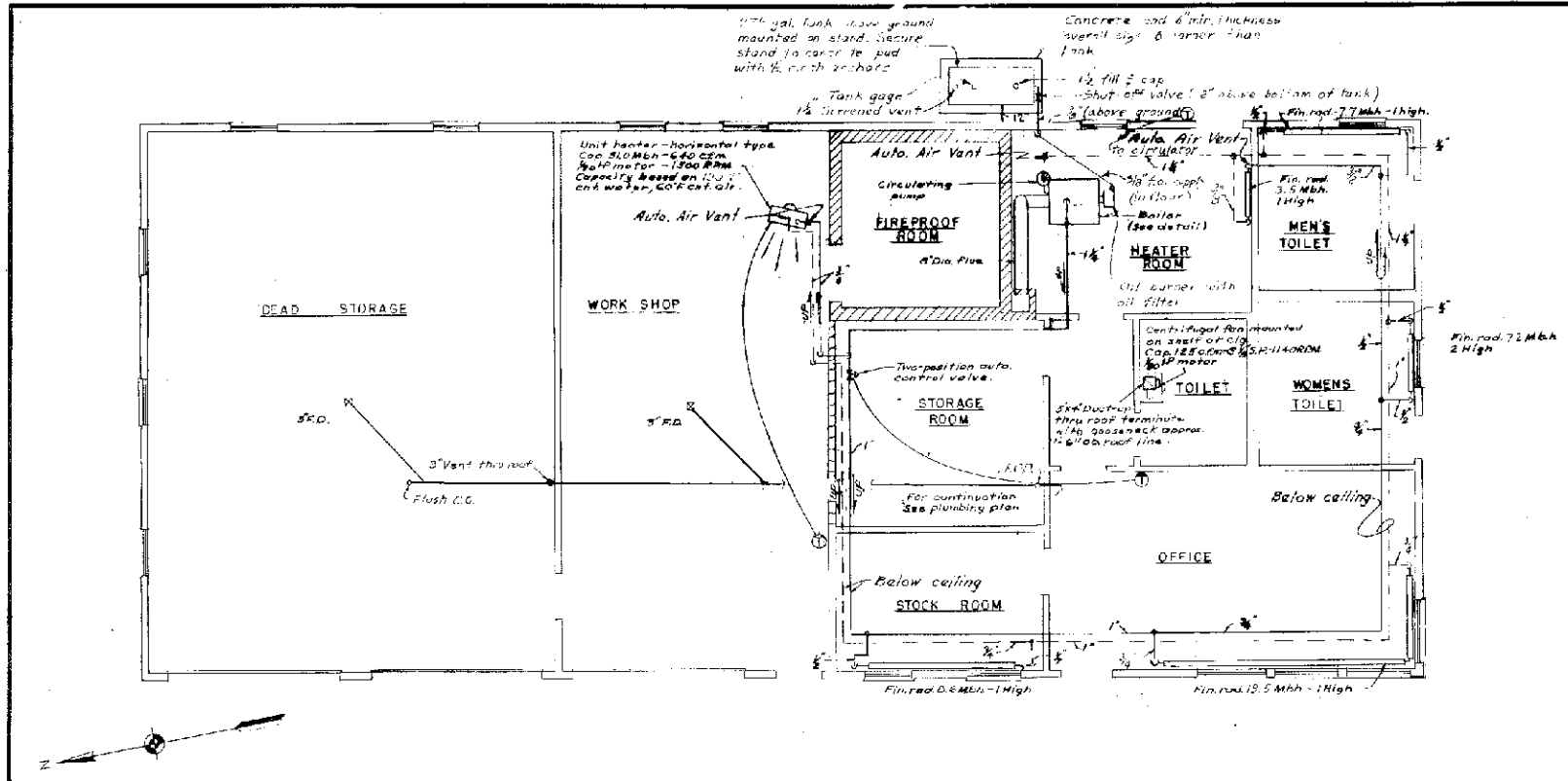
DRAWING NUMBER
CT-1-5809

SHEET 103

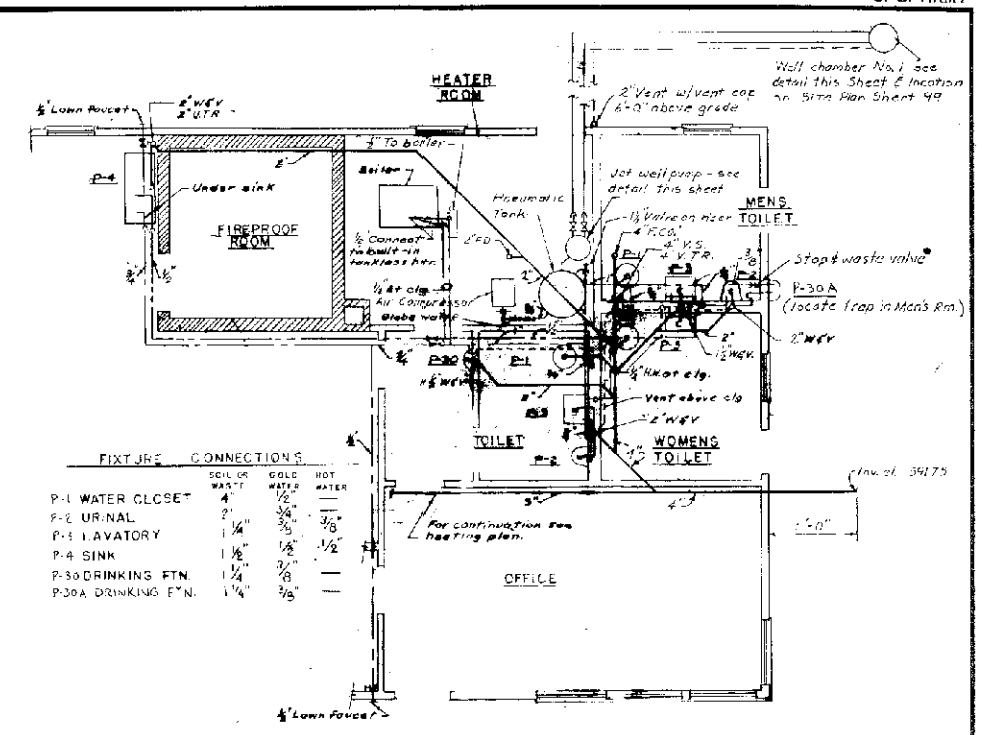
B

CORPS OF ENGINEERS

U. S. ARMY



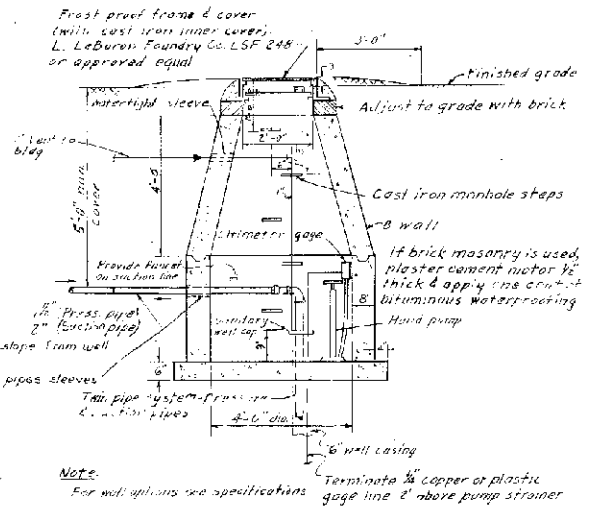
HEATING & VENTILATING PLAN
SCALE 1/4"= 1-0"



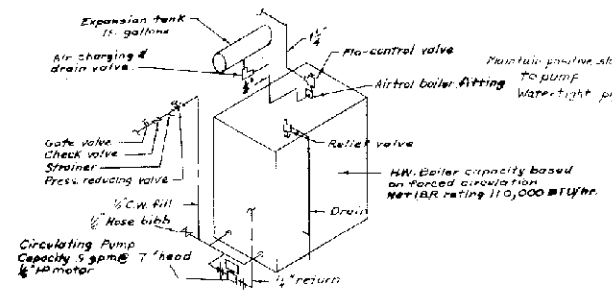
FIXTURE CONNECTIONS

	SOIL OR WASTE	COLD WATER	HOT WATER
P-1 WATER CLOSET	4"	1/2"	—
P-2 URINAL	2"	3/4"	—
P-3 LAVATORY	1 1/4"	3/8"	3/8"
P-4 SINK	1 1/2"	1/2"	1/2"
P-30 DRINKING FTN.	1 1/4"	3/8"	—
P-30A DRINKING FTN.	1 1/4"	3/8"	—

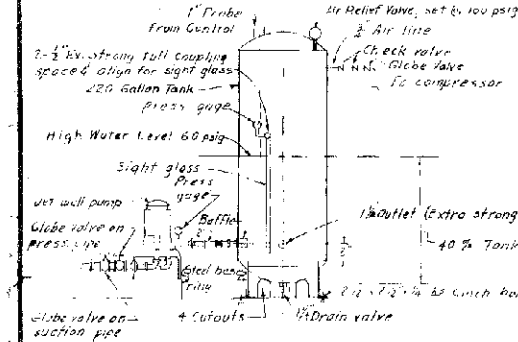
PLUMBING PLAN
SCALE 1/4"= 1'-0"



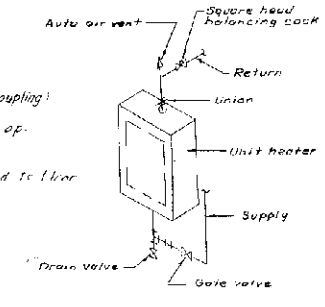
TYPICAL TAIL WELL CHAMBER
NOT TO SCALE



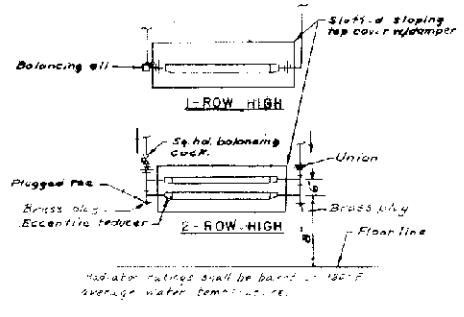
DETAIL BOILER CONNECTIONS
NOT TO SCALE



DETAIL-PNEUMATIC TANK
NOT TO SCALE



DETAIL UNIT HEATER
NOT TO SCALE



DETAIL-WALL FIN RADIATORS
NOT TO SCALE

NOTE

All work materials and equipment in connection with the plumbing, heating and ventilation, as specified, will be paid for under Item 96.

All work, materials and equipment in connection with the exterior water distribution system up to and including the well pump, as specified, will be paid for under Item 100.

LEGEND

———	HEATING SUPPLY
— — —	HEATING RETURN
———	SOIL OR WASTE
— - —	COLD WATER
— - - —	HOT WATER
- - - -	VENT
⋈	GATE VALVE
V.T.R.	VENT THRU ROOF
F.C.O.	FLUSH CLEAN OUT

GRAPHIC SCALE
SCALE 1/4" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.F.C. | DR. BY W.L.L. | CK. BY [illegible]

SUBMITTED [illegible] CHIEF, MECH. SECTION

PROJECT ENGINEER [illegible]

APPROVAL RECOMMENDED [illegible] CHIEF, CONST. BRANCH

APPROVAL RECOMMENDED [illegible] CHIEF, OP. & P. BRANCH

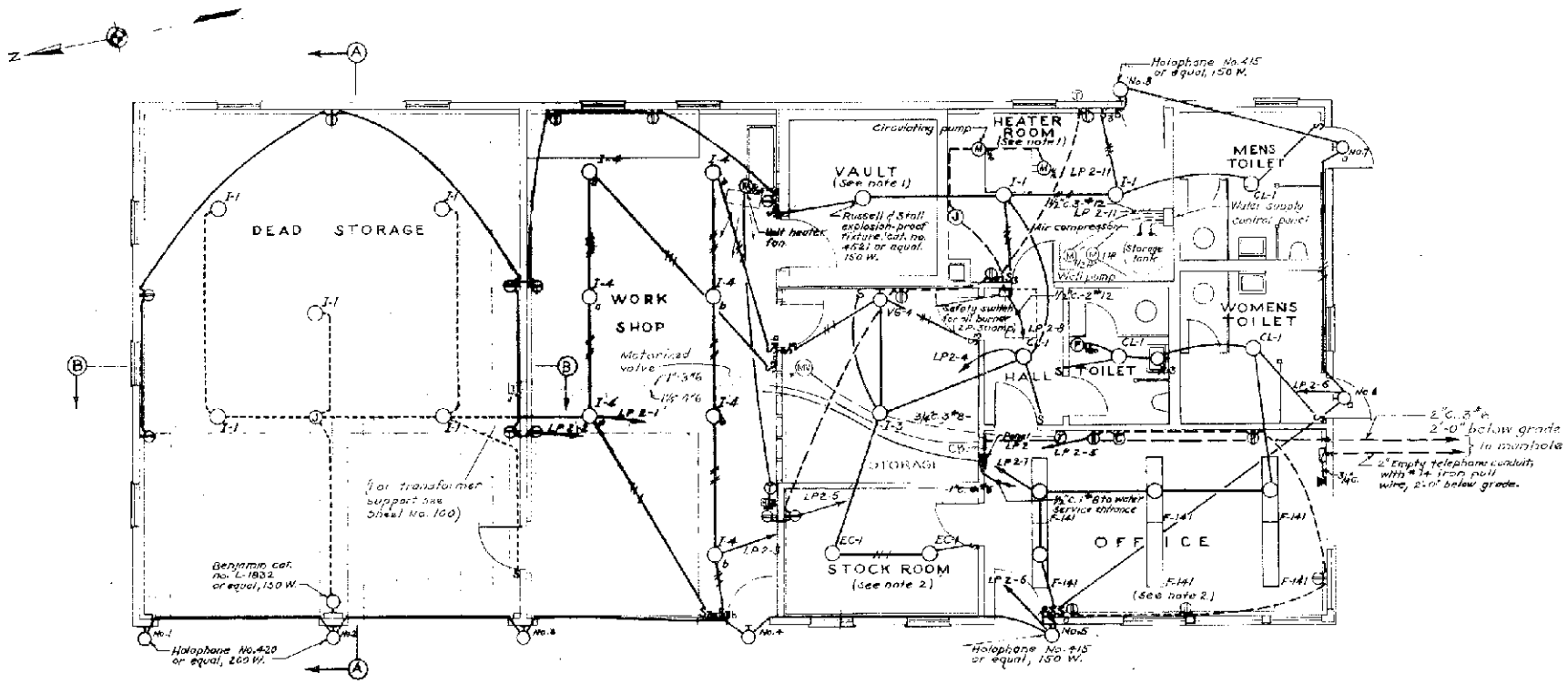
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
PLUMBING AND HEATING
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED [illegible] DATE [illegible]
CHIEF, ENGINEERING DIVISION

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 9-016-62-64

DRAWING NUMBER
CT-1-5810

SHEET 124



FLOOR PLAN
SCALE 1/4"=1'-0"

NOTES:

All wiring in vault and heater room shall be insulated conductors in rigid steel conduit.
Mount receptacles 18" above floor in the office and stock room.

The electrical work in the utility building will be paid for under item 36.

LEGEND

- Ceiling outlet and incandescent fixture
- Wall outlet and incandescent fixture
- Duplex convenience outlet. Mounting height 4'-0" unless otherwise indicated.
- Clock outlet, up 7'-0"
- Junction box.
- Telephone outlet.
- S — Single pole switch, up 4'-0"
- Fluorescent fixture and outlet.
- LP — Lighting panel.
- T — Transformer 15 KVA 3φ, 480-208/120 V., dry type. 2-5% taps below normal.
- SB — 3P- 600 V 100 amp circuit breaker, 30 amp. trip.
- Telephone conduit, concealed in floor.
- Branch circuit, concealed in ceiling or wall.
- Branch circuit, concealed in floor.
- Home run to panel board. Number of arrows indicates number of circuits. Note: Any circuit without further designation indicates a two wire #12 circuit. A greater number of #12 wires is indicated as follows: -///- (3 wires) -////- (4 wires), etc. 3/4"C-3#10 indicates 3/4" rigid steel conduit containing 3 #10 conductors.
- SP — Single pole switch with pilot light, up 4'-0"
- Motor starter.
- Thermostat, up 5'-0"
- HOA — Hand off Automatic selector switch, up 4'-0"
- Exhaust Fan.
- Telephone terminal cabinet 12"x16"x4"
- Safety switch.
- Branch circuit, run exposed.

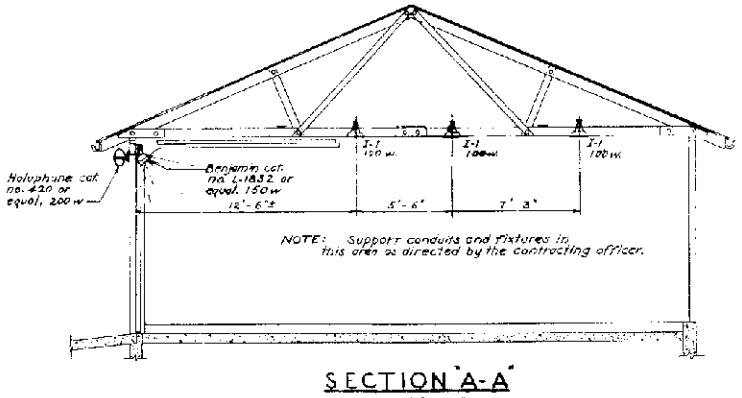
LIGHTING PANEL LP 2

120/208 V., 3 PH., 4 WIRE, 3φ
100 AMP. MAINS LUGS ONLY

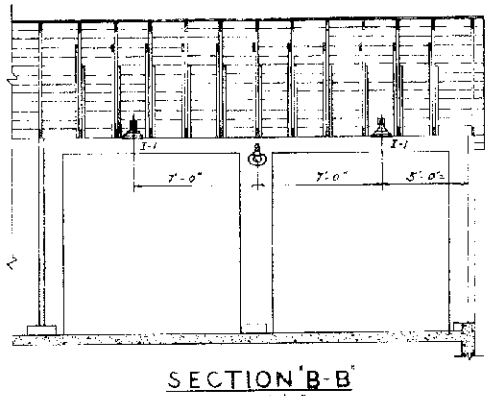
CIR. NO.	BRANCH BREAKER SIZE-AMPS	NO. POLES	SERVES	CONNECTED LOAD WATTS
1	20	1	Lights - Dead storage and Work shop	1550
2			Receptacles Dead storage and Work shop	1500
3			Lights - Work shop	1200
4			Lights - Knock rm. storage, hall, toilet heater rm & vault	1140
5			Receptacles - Office, shop, stock, heater & storage rms.	1500
6			Lights - Exterior	1500
7			Lights - Offices & toilets	900
8			Oil burner motor, Unit heater fan motor, Tank Circulating pump	600
9&10		2	Spares	
11	Y	3	Well pump 1 HP	1140
Total connected load				11390

LIGHTING FIXTURE SCHEDULE

LOCATION	C. OF E. TYPE	LAMP WATTAGE	MTG. HEIGHT	REMARKS
Dead storage	I-1 (Benj. L-1832 or equal)	100 150	11'-0" 10'-0"	Between trusses On wall
Work shop	I-4	300	10'-6"	Ceiling mtg.
Stock room	EC-1	100	7'-3"	Ceiling mtg.
Storage	I-5 VG-4	200 150	7'-6" 7'-0"	Ceiling mtg. On wall
Vault	R&S cat. no. 4521 or equal	150	6'-6"	Ceiling mtg.
Heater room	I-1	100	7'-0"	Ceiling mtg.
Office	F-141	2-40	7'-6"	Surface mtg.
Toilet	CL-1 R-3	2-60 60	7'-9" 6'-8"	Ceiling mtg. On wall
Hall	CL-1	2-60	7'-9"	Ceiling mtg.
Toilet (pub)	CL-1	2-60	7'-9"	Ceiling mtg.
Exterior Nos. 1,2,3&4	Holophane 420 or equal	200	10'-0"	Wall mtg.
Exterior Nos. 5&7	Holophane 415 or equal	200	8'-0"	Wall mtg. over door
Exterior No. 6	Holophane 415 or equal	150	7'-0"	Wall mtg.



SECTION 'A-A'
SCALE 1/4"=1'-0"



SECTION 'B-B'
SCALE 1/4"=1'-0"

GRAPHIC SCALE
1/4"=1'-0"

REVISED	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

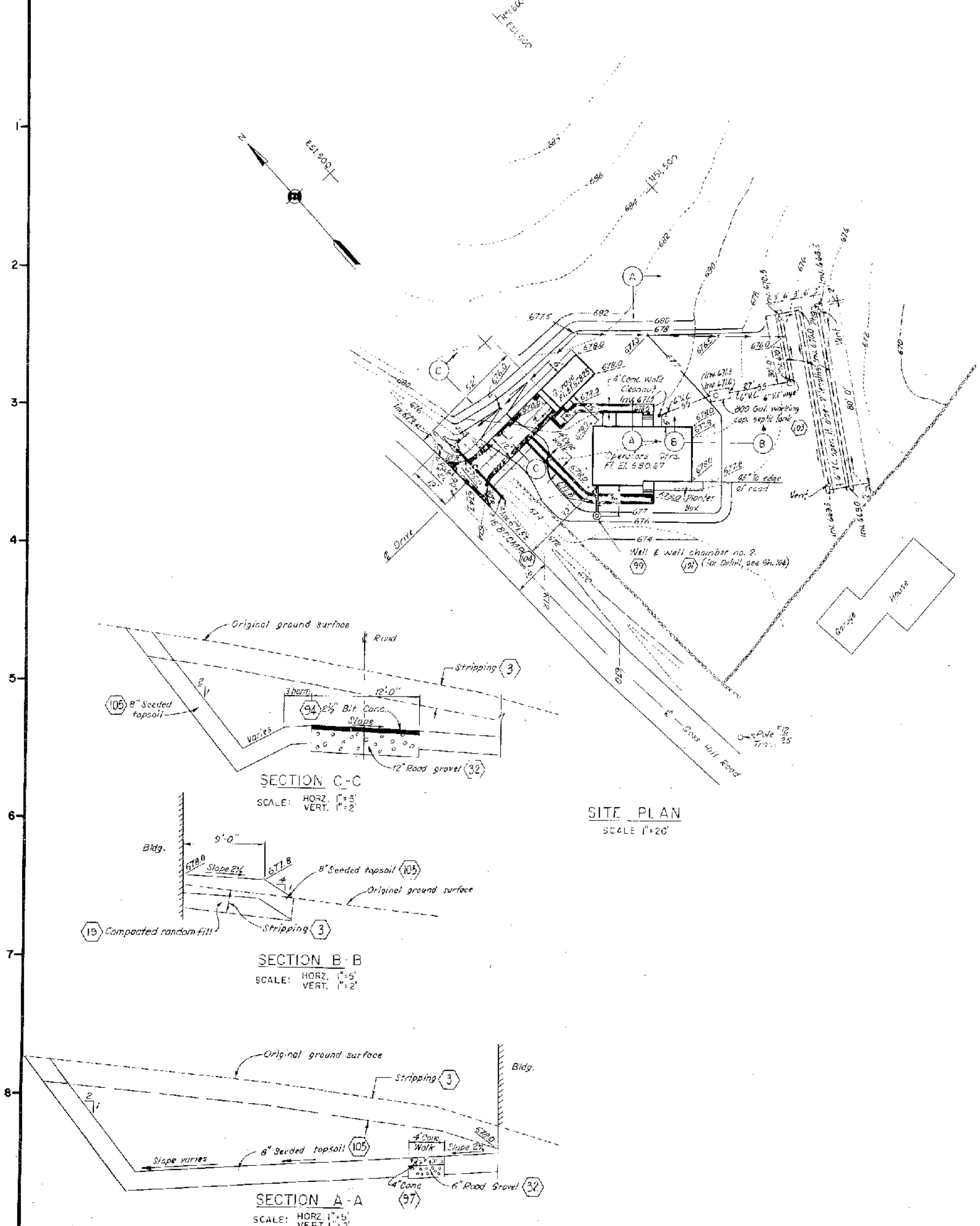
DES. BY J.A.C. | DR. BY E.I.N. | CK. BY J.R.
SUBMITTED — CHIEF, E. & C. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED — CHIEF, ENGR. BRANCH
APPROVED — RECOMMENDED — CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
UTILITY BUILDING
ELECTRICAL
PLAN AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED — DATE MARCH, 196-

SCALE 1/4"=1'-0" | SPEC. NO. ENG-19-020-62-49
DRAWING NUMBER CT-1-581
SHEET 105

CORPS OF ENGINEERS | U. S. ARMY



SITE PLAN
SCALE 1"=20'

SECTION C-C
SCALE: HORZ. 1"=5' VERT. 1"=2'

SECTION B-B
SCALE: HORZ. 1"=5' VERT. 1"=2'

SECTION A-A
SCALE: HORZ. 1"=5' VERT. 1"=2'

LEGEND (THIS SHEET ONLY)

NEW	EXISTING	DESCRIPTION
x677.0	x677.8	Elevations
—674—	···674···	Contours
		Paved Areas
		Stone Wall
—C—		Culvert
→		Grade to drain
		Buildings
	o	Utility pole
—W—		Water line
—SS—		Sanitary Sewer

NOTES

Existing contours shown on Goss Hill Road indicates finish grades after completion of road improvement.
For details of concrete walk see Sheet 30
Figures in hexagons indicate item numbers under which payment will be made.
For cleanout and leaching trench system, see details sheet 99.
Location of septic tank to be determined in the field.
For septic tank material see specifications.

GRAPHIC SCALES
2' — 0 2' 4'
1"=5' — 5' 0 5' 10'
1"=20' — 20' 0 20' 40'

REVISION	DATE	DESCRIPTION	BY

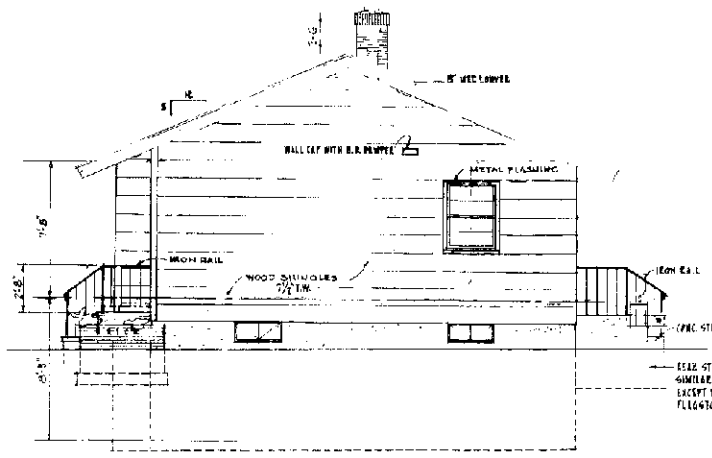
U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.McL. | DR. BY D.L.W. | CK. BY

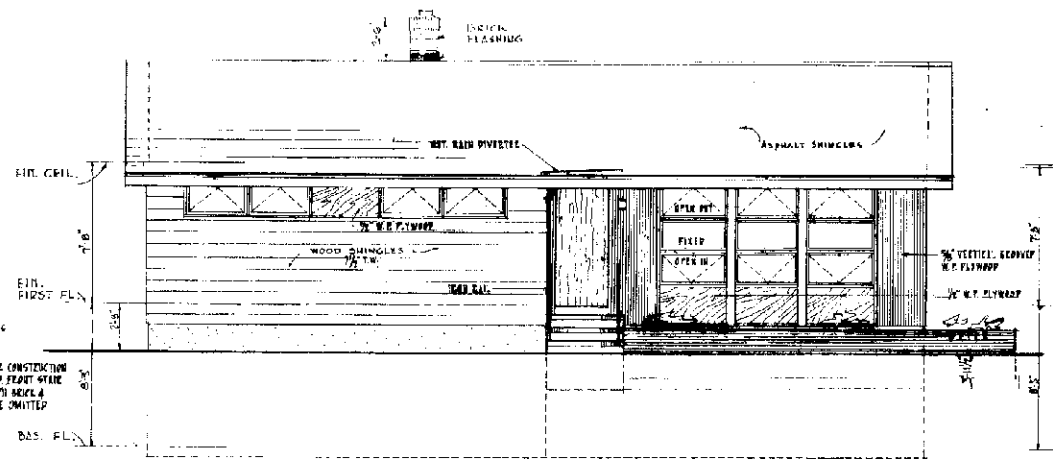
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS' QUARTERS
SITE PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

DATE MARCH 1962
SCALE: AS SHOWN | SPEC. NO. ENG-19-016-62-49
DRAWING NUMBER CT-1-5812
SHEET 106

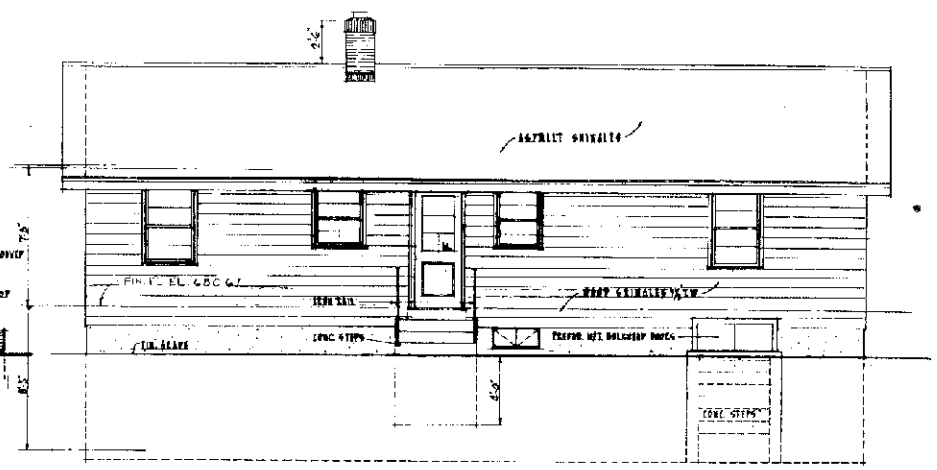
CORPS OF ENGINEERS — U. S. ARMY



RIGHT ELEVATION
SCALE 1/4"=1'-0"



FRONT ELEVATION
SCALE 1/4"=1'-0"

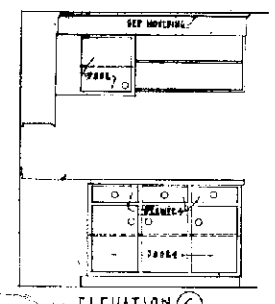


REAR ELEVATION
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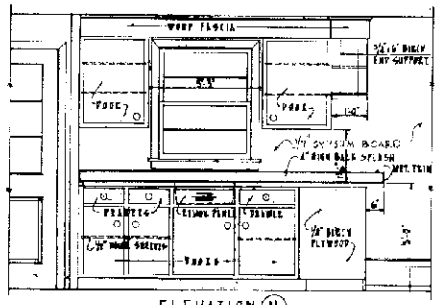
INTERIOR FINISH SCHEDULE

ROOM	FLOOR	BASE	WAINSCOT	WALLS	CEILING	TRIM	REMARKS
BED ROOMS	WOOD	WOOD		GYPSUM BD.	GYPSUM BD.	WOOD	
LIVING ROOM	"	"		"	"	"	
DINING ROOM	"	"		"	"	"	
CLOSETS	"	"		"	"	"	
HALL	"	"		"	"	"	
KITCHEN	LINOLEUM	"		PLASTER	PLASTER	"	
BATHROOM	CERAMIC TILE	CERAMIC TILE	CERAMIC TILE	PLASTER	PLASTER	"	
STAIRWELL				GYPSUM BD.	GYPSUM BD.	"	
BASEMENT	CONC.			CONC.			

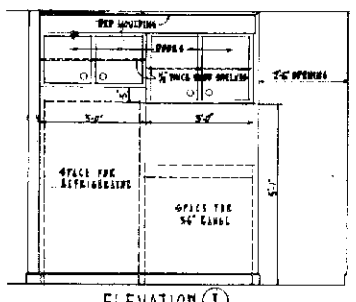
NOTE: ALL WALLS AND CEILINGS SHALL BE PAINTED.



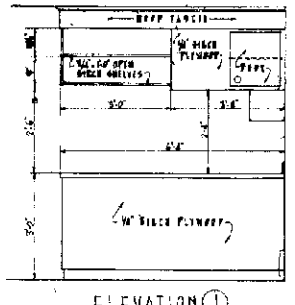
ELEVATION (G)
SCALE 1/2"=1'-0"



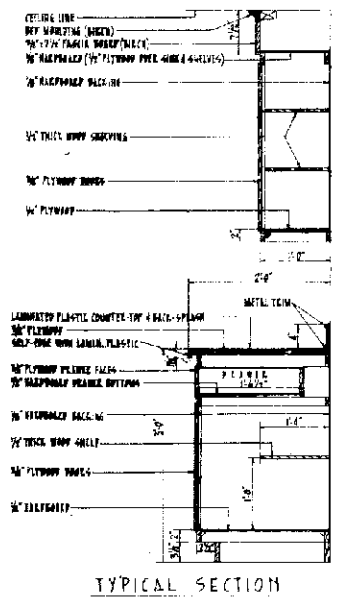
ELEVATION (H)
SCALE 1/2"=1'-0"



ELEVATION (I)
SCALE 1/2"=1'-0"

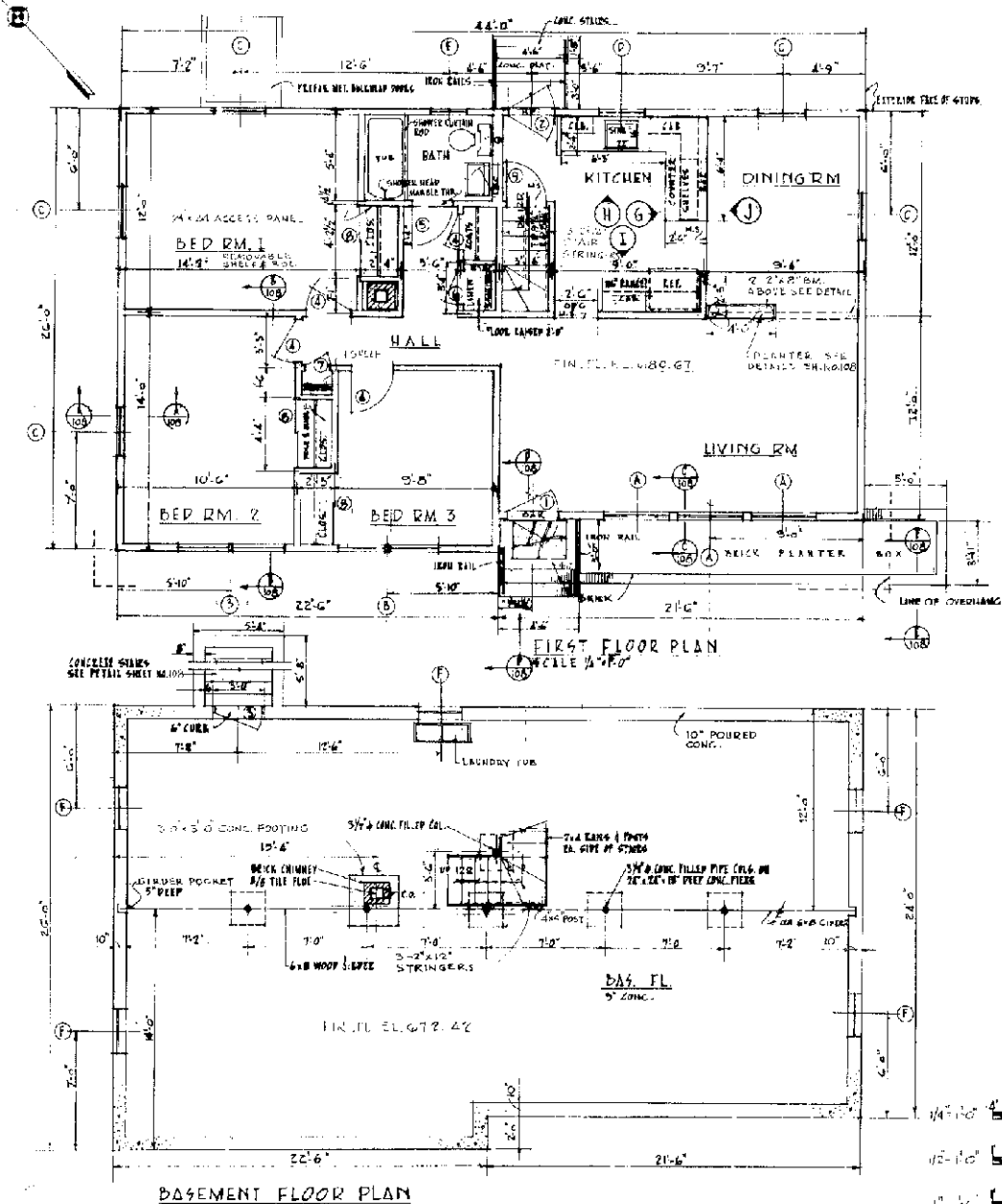


ELEVATION (J)
SCALE 1/2"=1'-0"



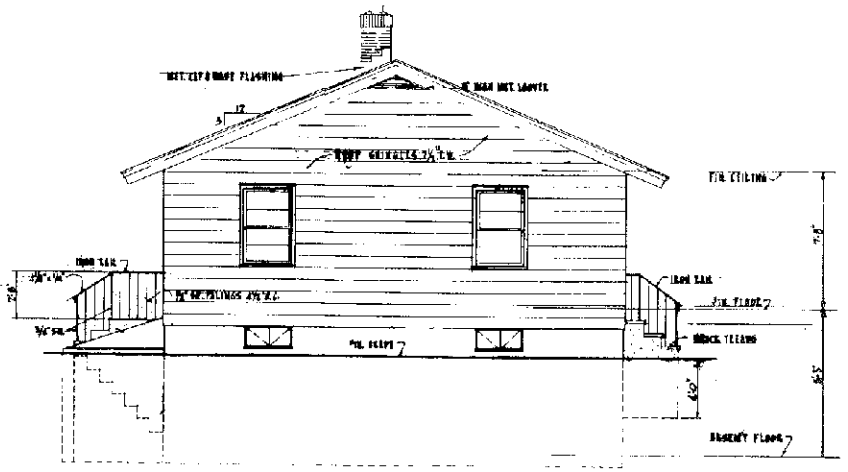
TYPICAL SECTION
SCALE 1"=1'-0"

KITCHEN CABINET DETAILS



FIRST FLOOR PLAN
SCALE 1/4"=1'-0"

BASEMENT FLOOR PLAN
SCALE 1/4"=1'-0"



LEFT ELEVATION
SCALE 1/4"=1'-0"

DOOR SCHEDULE

NO.	SIZE	SLIDING DOOR	SWINGING DOOR	FLUSH	GLAZED					
1	3'-0"x6'-8"x1 3/8"		•	•						
2	2'-6"x6'-8"x1 3/8"		•	•	•					
3	2'-8"x6'-8"x1 3/8"		•	•						
4	2'-8"x6'-8"x1 3/8"		•	•	•					
5	2'-4"x6'-8"x1 3/8"		•	•	•					
6	2'-0"x6'-8"x1 3/8"		•	•	•					
7	1'-6"x6'-8"x1 3/8"		•	•	•					
8	2'-8"x6'-8"x1 3/8"	•		•	•					
9	2'-6"x6'-8"x1 3/8"	•		•						

WINDOW SCHEDULE

NO.	TYPE	OVERALL SASH OPENING SIZE WIDTH	HEIGHT	SASH MATERIAL	GLAZING	REMARKS
A	RUNNING CASE.	5'-10"	5'-5 3/4"	WOOD	INSULATING GLASS	SEE SECTION
B	RUNNING	6'-6 3/4"	1'-8 3/4"	"	"	"
C	DOUBLE HUNG	2'-8"	4'-2"	"	SINGLE	"
D	"	2'-8"	5'-2"	"	"	"
E	"	2'-4"	5'-2"	"	"	"
F	BASEMENT WIN.	2'-8 3/4"	1'-2 3/4"	STEEL	"	SEE DETAIL SHEET 108

NOTE:
INTERIOR & EXTERIOR BEARING WALLS SHALL BE 2x4 STUDS 16" O.C., ALL OTHER WALLS SHALL BE 2x3 STUDS EXCEPT WHERE SHOWN OTHERWISE.
ALL ITEMS ON THIS SHEET ARE TO BE PAID FOR UNDER ITEM NO. 97.

GRAPHIC SCALES
1/4"=1'-0"
1/2"=1'-0"
1"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.S. | DR. BY J.G. | CK. BY

SUBMITTED
CHIEF, A&D SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
CHIEF, E. & C. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
FLOOR PLANS, ELEVATIONS AND SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

APPROVED
CHIEF, ENGINEERING DIVISION

DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV ENG. 19-016-62-49

DRAWING NUMBER
CT-I-5813

SHEET 107

CORPS OF ENGINEERS — U. S. ARMY

FLOOR FRAMING PLAN

CEILING FRAMING PLAN

SECTION F

DETAILS OF PLANTER

SECTION E

SILL WHEEL DETAIL

TYPICAL BASEMENT WINDOW DET.

FULL SIZE INTERIOR WINDOW & DOOR TRIM

FULL SIZE FAVE TRIM

FULL SIZE EXTERIOR VEE GROOVED PLYWOOD

JAMB HEAD SIMILAR
INT. DOOR DETAIL
SCALE: 1½"=1'-0"

SECTION A

SECTION B

SECT. THRU EXT. WALL IN BATURM.

SECTION C

SECTION D

GRAPHIC SCALES

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

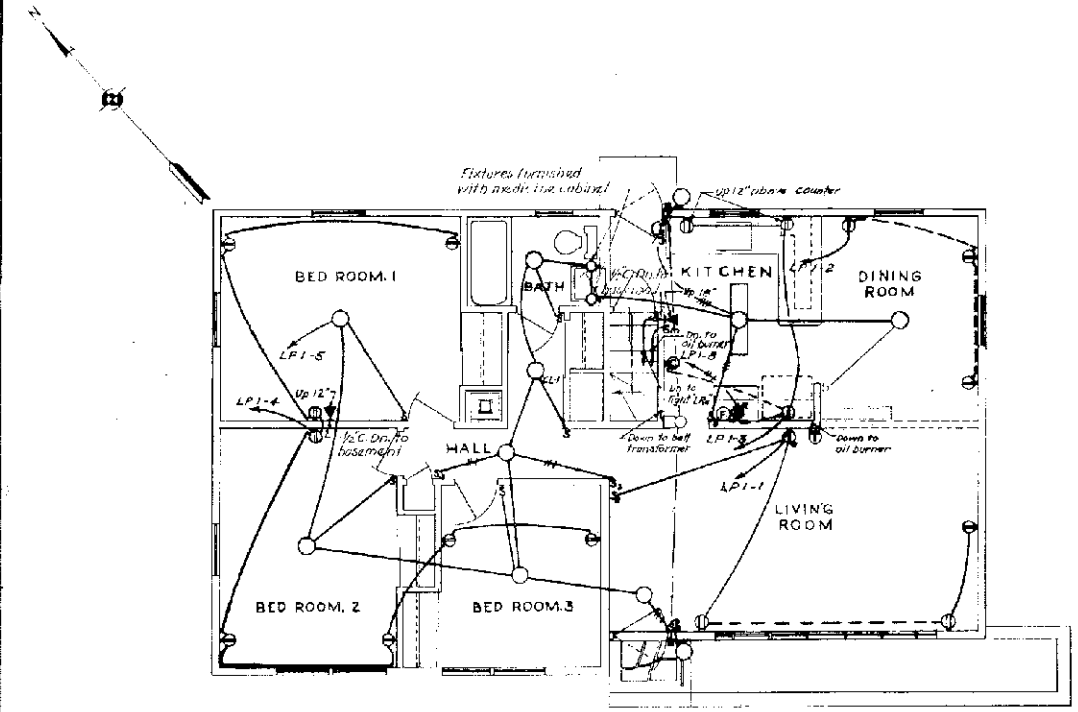
DES. BY	DR. BY	CK. BY
J.S.	J.S.	

SUBMITTED
CHIEF, ENGR. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, OF SN. BRANCH
APPROVAL RECOMMENDED
CHIEF, ENGR. BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
FRAMING PLANS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

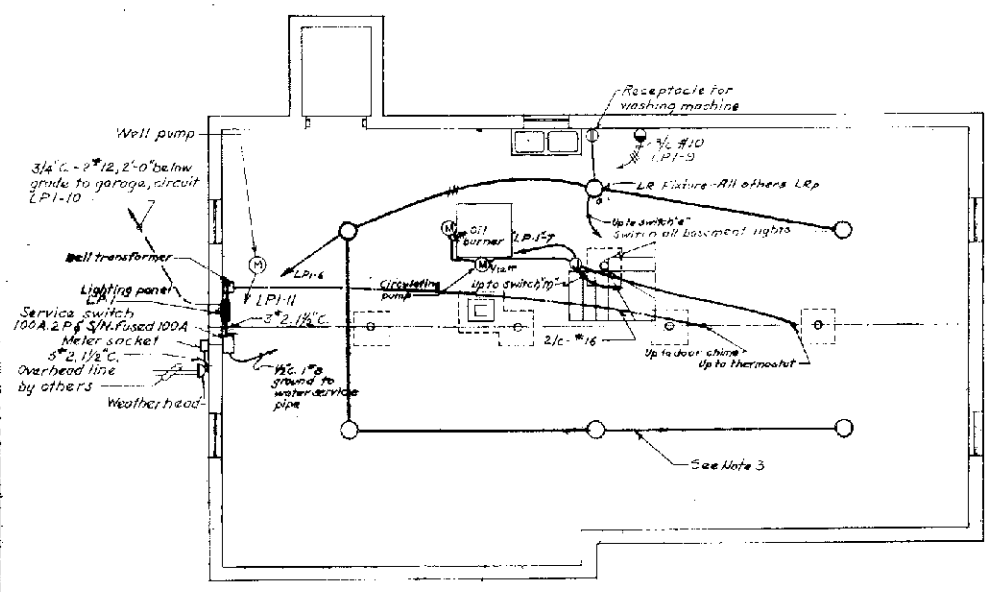
APPROVED
CHIEF, ENGINEERING DIV. & BR.
DATE

SCALE AS SHOWN SPEC NO. DIV ENG 19-016-62-49
DRAWING NUMBER
CT-1-5814
SHEET 106



FIRST FLOOR PLAN

SCALE ¼"=1'-0"



BASEMENT FLOOR PLAN

SCALE ¼"-1'-0"

LIGHTING FIXTURE SCHEDULE				
LOCATION	C. OF E. TYPE	LAMP WATTAGE	MTG. HEIGHT	REMARKS
Living room	R-9	40		Ceiling mtg.
Bed room 1	R-12	2-40		Ceiling mtg.
Bed room 2	R-12	2-40		Ceiling mtg.
Bed room 3	R-12	2-40		Ceiling mtg.
Hall	R-10	2-60		Ceiling mtg.
	CL-1	2-60		Ceiling mtg.
Bath	R-9	40		Ceiling mtg.
Kitchen	F-7	2-40		Surface mtg.
Dining room	R-12	2-40		Ceiling mtg.
Basement	LR	60		Ceiling mtg.
	LRp	60		Ceiling mtg.
Exterior	R-5	60		Wall mtg.

LIGHTING PANEL LP 1				
120/240V, S/N, 3 WIRE, 1φ 100 AMP MAINS				
CIR. NO.	BRANCH BREAKER SIZE-AMPS	NO. POLES	SERVES	CONNECTED LOAD WATTS
1.	20	1	Receptacles Living room	750
2.			Receptacles Dining room	1000
3.			Recept. Refrig. & Kitchen	1200
4.			Receptacles Bed rooms	1200
5.			Lights. First floor	910
6.			Lights & Recpt. Basement	860
7.			Oil burner & pump Basement	400
8.	50	2	Range Kitchen	11,000
9.	"	"	Clothes dryer Basement	8000
10.	20	1	Light & Recept Garage	210
11.	20	2	Well pump	1000
Total connected load				26530

LEGEND

- Ceiling outlet and incandescent fixture.
- Wall outlet and incandescent fixture.
- Duplex convenience outlet. Mounting height 18" unless otherwise indicated.
- Range outlet, (50A. 250V. 3 wire).
- Clock outlet, mount 7'-0" up.
- Junction box.
- Fan outlet.
- Thermostat, mount 5'-0" up.
- Telephone outlet.
- S_a Single pole switch, up 3'-6", letter indicates fixture controlled.
- S_{PD} Oil burner emergency switch.
- S_3 Three way switch.
- Fluorescent fixture and outlet.
- Lighting panel.
- Bell transformer.
- Push button.
- Door chime.
- Outlet for clothes dryer (50A. 250V. 3 Wire).
- Bell circuit concealed.
- Branch circuit, concealed in ceiling or wall.
- Branch circuit, concealed in floor.
- Home run to panel board. Number of arrows indicates number of circuits.

Note: Any circuit without further designation indicates a two wire #12 circuit. A greater number of #12 wires is indicated as follows: +++ (3 wires) ++++ (4 wires), etc. 3/4"c. 3#10 indicates 3/4" rigid steel conduit containing 3#10 conductors.

NOTES

Ground neutral lighting conductor to tie out going water line with #6 copper and suitable ground clamp.

Electrical work in the operations quarters will be paid for under Item 9?

All wiring indicated on basement ceiling shall be run through joists to allow for future finishing of basement.

GRAPHIC SCALE

1/4"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.A.J. | DR. BY G.T.N. | CK. BY H.K.

SUBMITTED: CHIEF, DESIGN BRANCH

PROJECT ENGINEER

PERSONAL RECOMMENDED: CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED: CHIEF, CONSTR. & OPN. BRANCH

APPROVED: CHIEF ENGINEERS DIVISION

DATE

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
ELECTRICAL PLAN
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

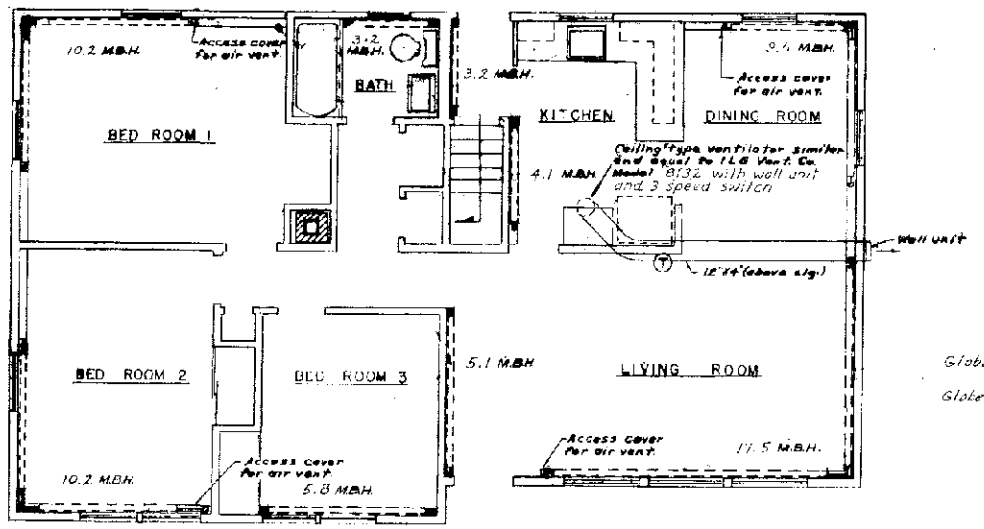
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DRAWING NUMBER
CT-I-5815

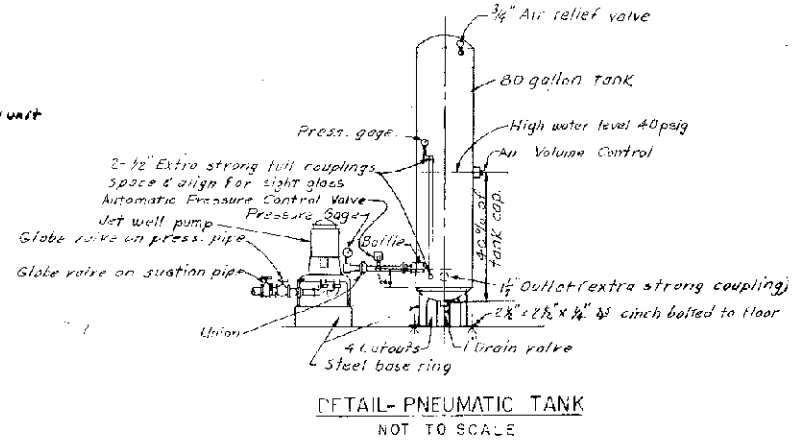
SHEET 109

CORPS OF ENGINEERS

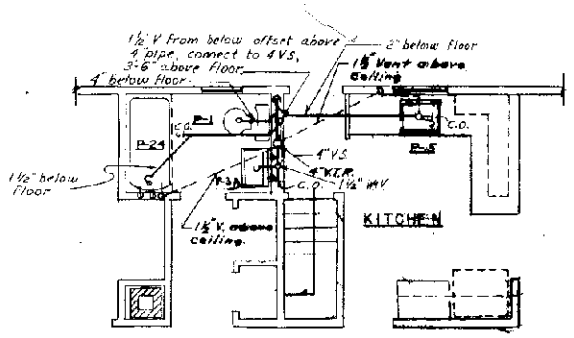
U. S. ARMY



FIRST FLOOR PLAN — HEATING & VENTILATION



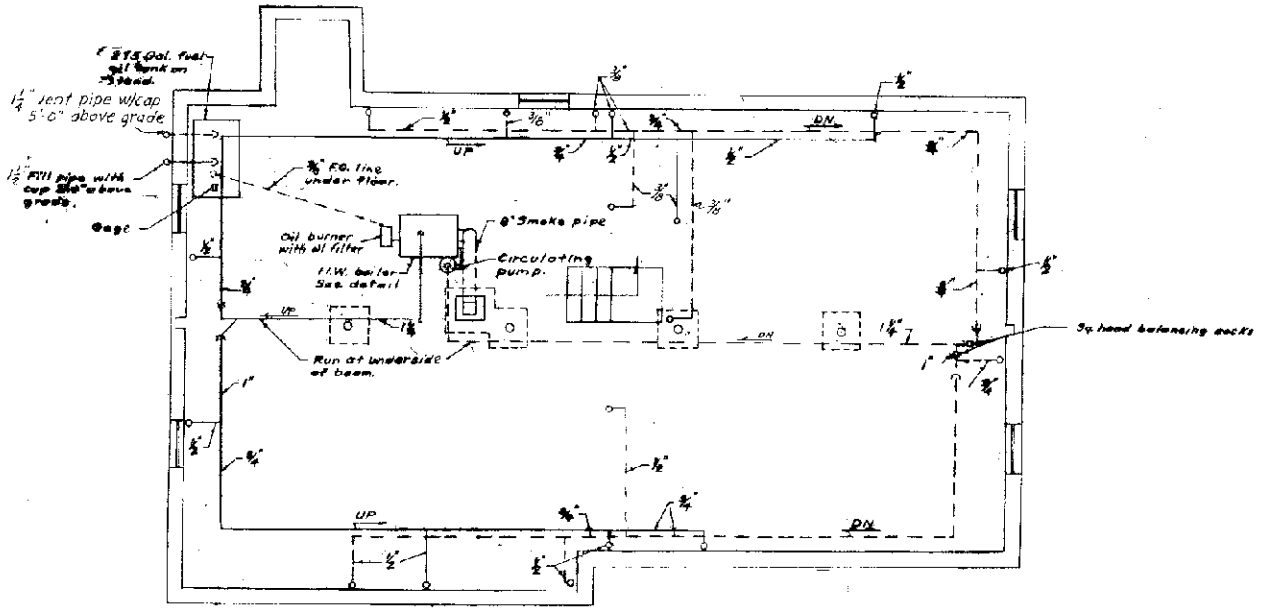
DETAIL- PNEUMATIC TANK
NOT TO SCALE



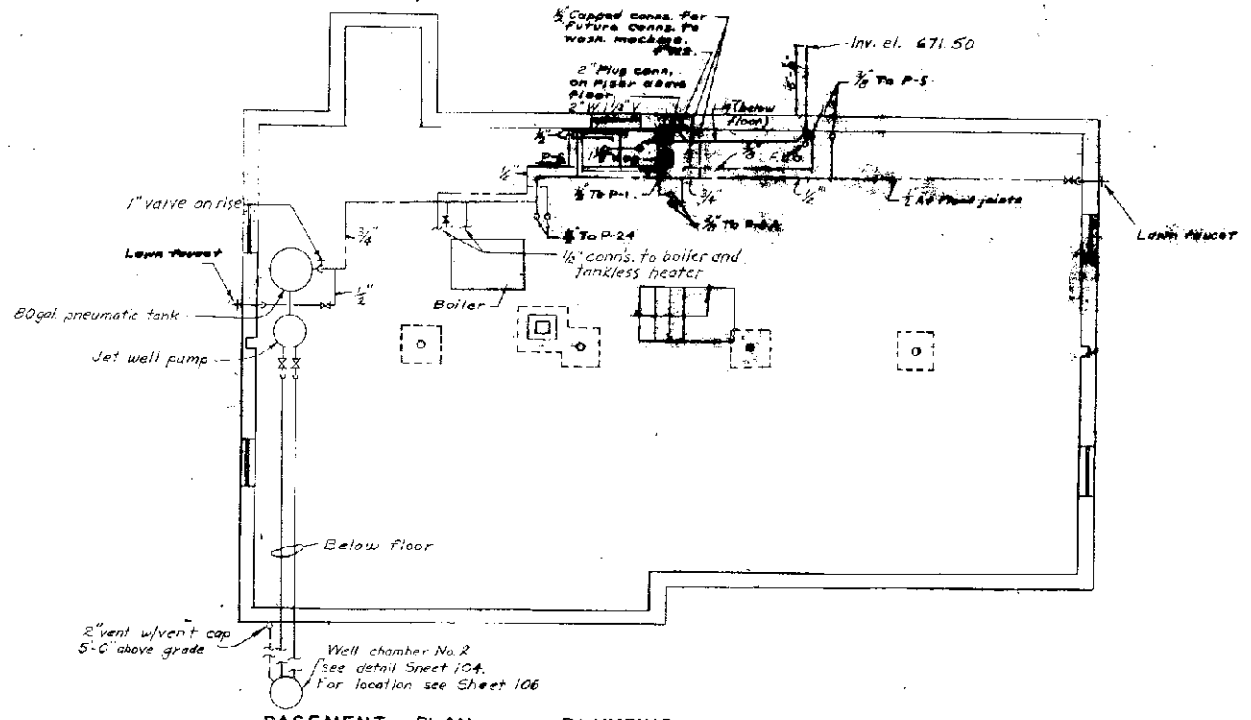
PART PLAN — PLUMBING

LEGEND

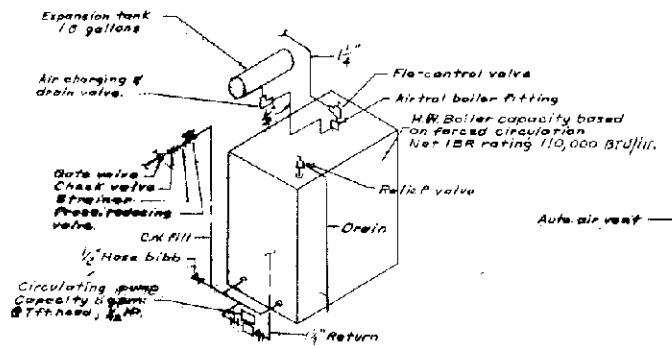
———	HEATING SUPPLY
- - - -	HEATING RETURN
———	SOIL OR WASTE
- - - -	VENT
———	COLD WATER
- - - -	HOT WATER
——⋈——	GATE VALVE
W&V.	WASTE & VENT
V.T.R.	VENT THRU ROOF
V.	VENT



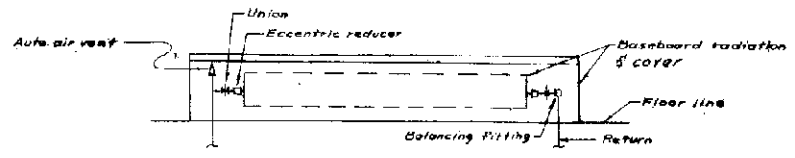
BASEMENT PLAN — HEATING



BASEMENT PLAN — PLUMBING



DETAIL — BOILER CONNECTIONS



DETAIL — BASEBOARD RADIATION

NOTES

Piping in basement shall be run as high as possible to allow a maximum of headroom.

Baseboard radiation capacities based on 180°F average water temperature and 20°F temperature drop.

Provide continuous manual dampers for each section of radiation. Extend radiation covers wall to wall.

All work materials and equipment in connection with the heating, plumbing and ventilating, as specified, will be paid for under Item 97.

All work, materials and equipment in connection with the exterior water system up to and including the well pump, as specified, will be paid for under Item 101.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. By J.F.C. | DR. By W.J.J. | CK. By

SUBMITTED
CHIEF, DESIGN SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, DESIGN BRANCH

APPROVAL RECOMMENDED
(CHIEF, E. & D. BRANCH)

APPROVED
CHIEF, ENGINEERING DIVISION

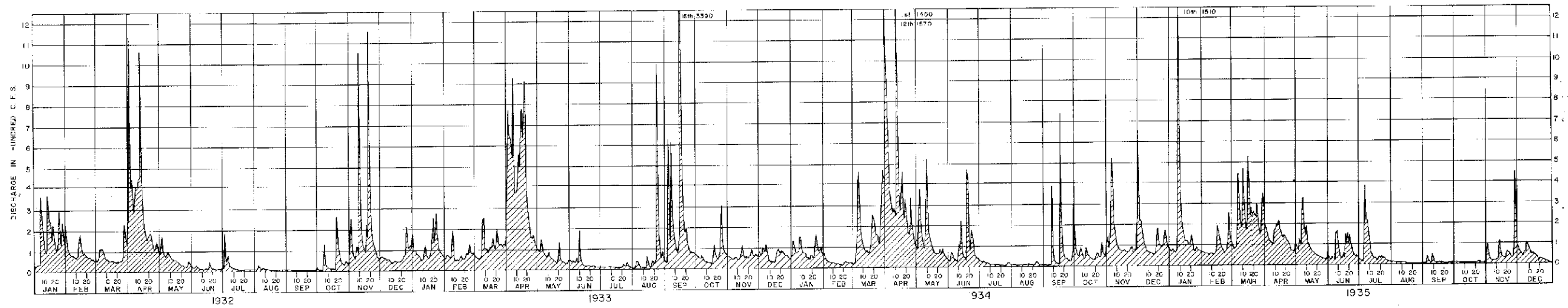
DATE MARCH 1962

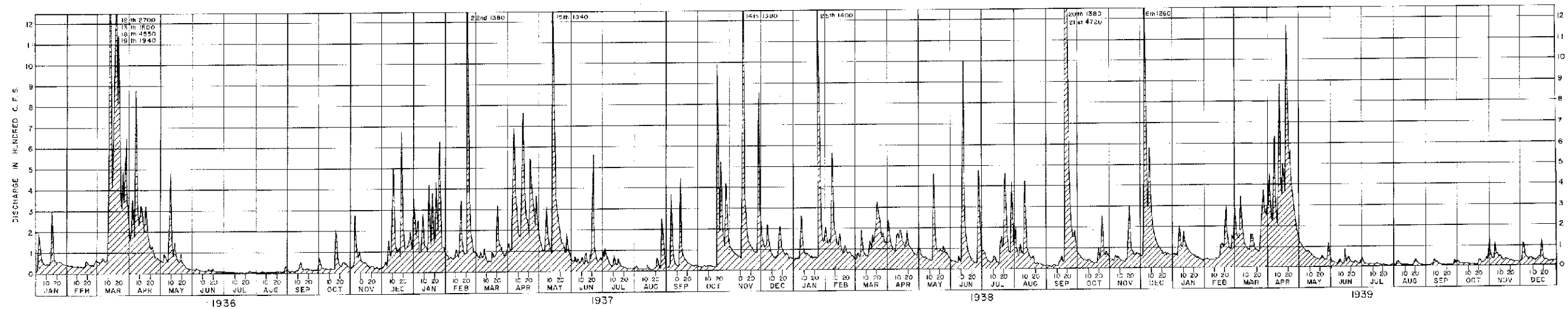
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
OPERATORS QUARTERS
PLUMBING AND HEATING
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

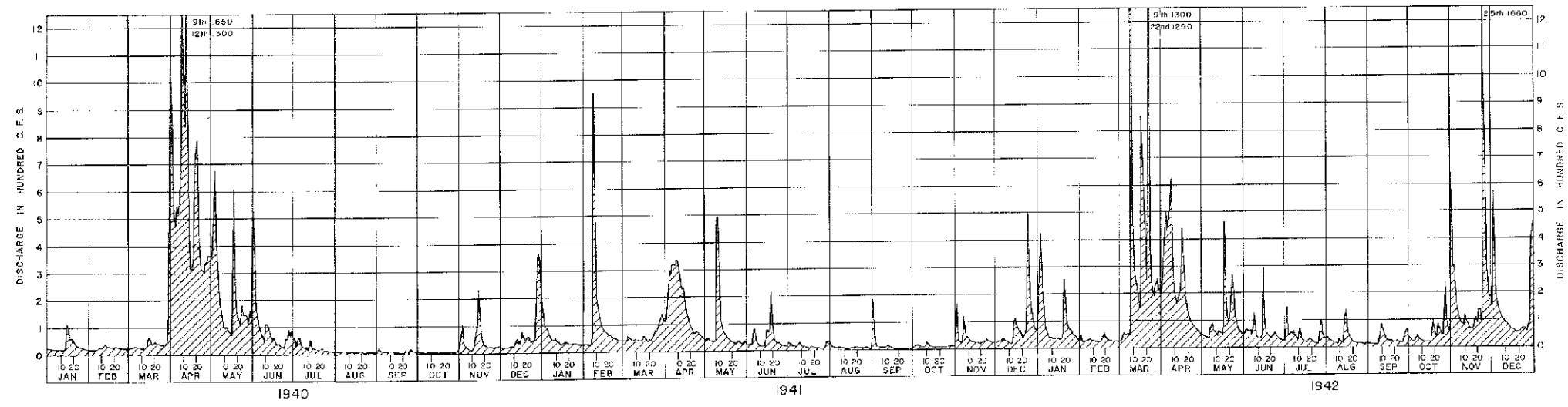
8

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warrantees but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY R.J.B. | TR. BY | CK. BY E.P.S.

SUBMITTED: CHIEF, R. & H. BRANCH

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE RESERVOIR
HYDROGRAPHS NO. 3
MIDDLE BRANCH WESTFIELD RIVER, MASS.

APPROVED: CHIEF, ENGINEERING DIVISION — DATE

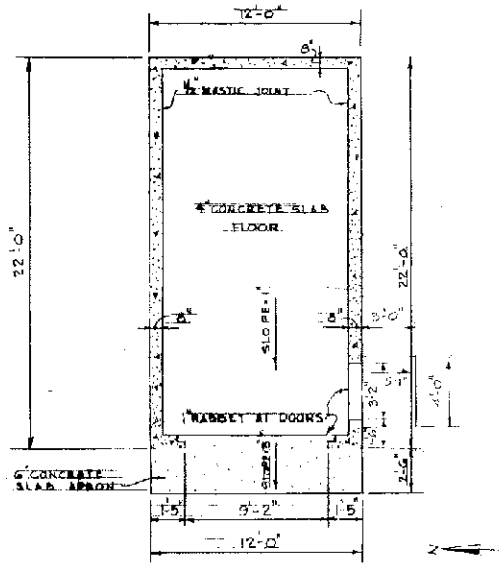
RECOMMENDED: CHIEF, R. & H. BRANCH

SCALE AS SHOWN | SPEC. NO. DIV ENG-9-016-[illegible]

DRAWING NUMBER
CT-1-5728

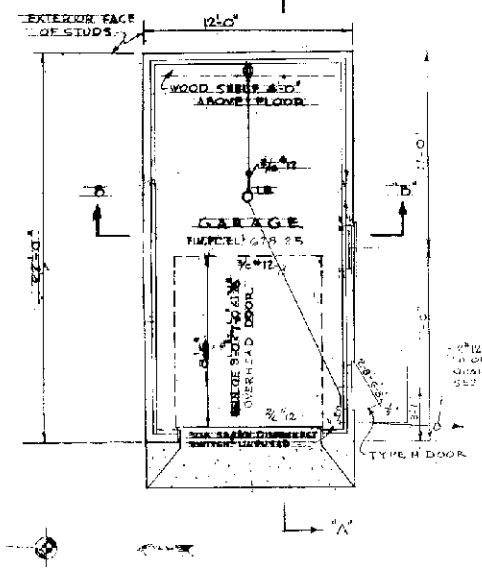
SHEET 5

CORPS OF ENGINEERS — U. S. ARMY



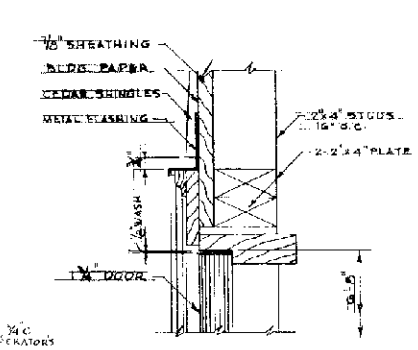
FOUNDATION PLAN

SCALE: 1/4"=1'-0"

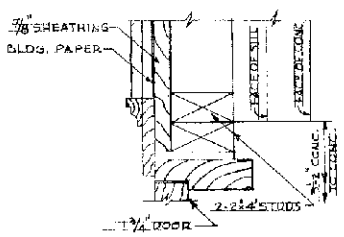


FLOOR PLAN

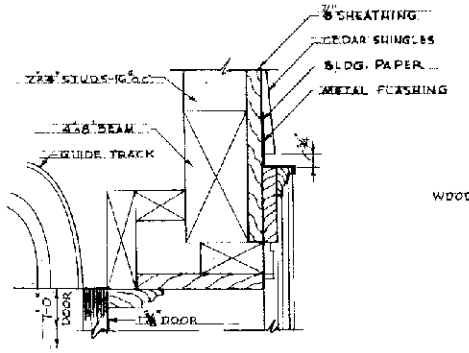
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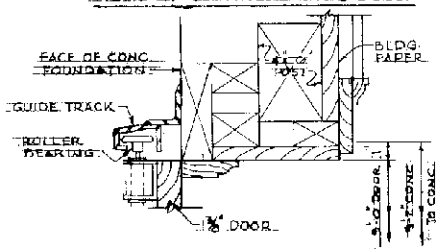
HEAD



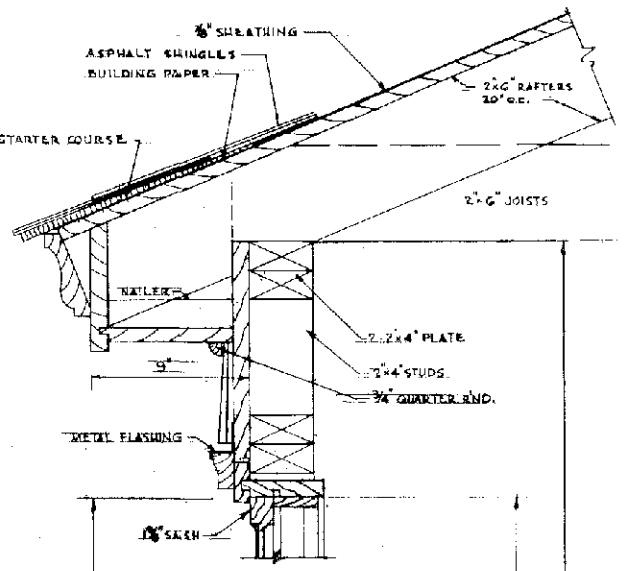
JAMB



HEAD OF OVERHEAD TYPE DOOR

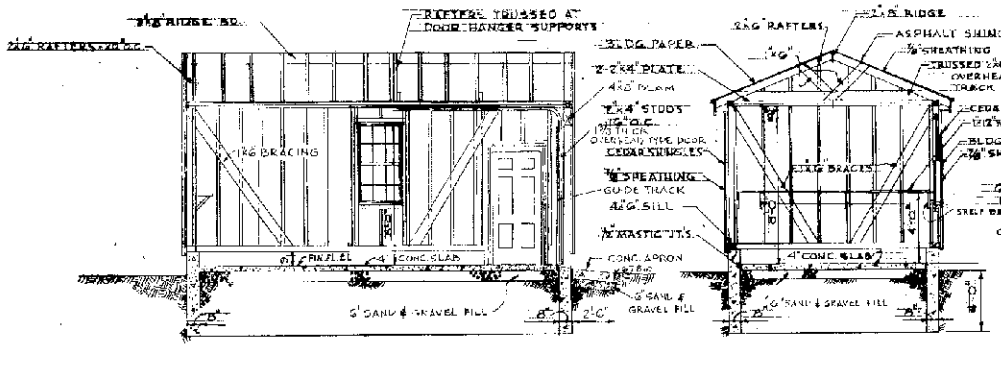


JAMB OF OVERHEAD TYPE DOOR



SECTION THRU CORNICE

SCALE: 3"=1'-0"

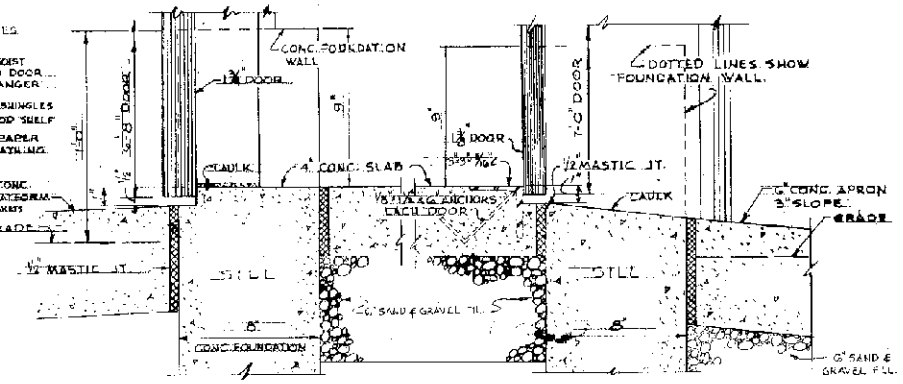


SECTION "A-A"

SCALE: 1/4"=1'-0"

SECTION "B-B"

SCALE: 1/4"=1'-0"

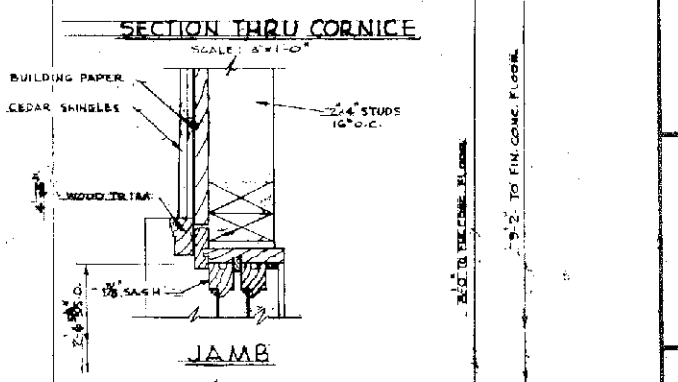


DETAIL OF ENT. DOOR

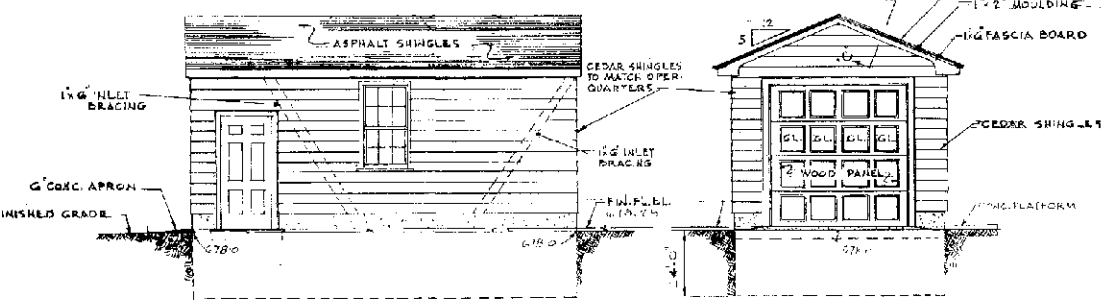
DETAIL OF OVERHEAD TYPE DOOR

DOOR DETAILS

SCALE: 3"=1'-0"



JAMB

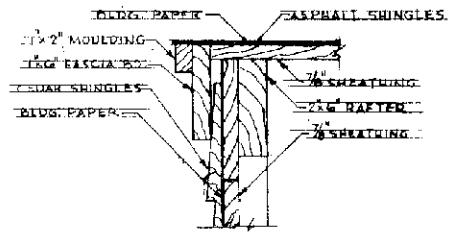


SOUTH ELEVATION

SCALE: 1/4"=1'-0"

WEST ELEVATION

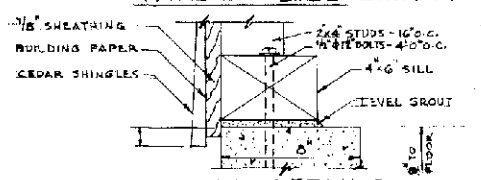
SCALE: 1/4"=1'-0"



SECTION "C-C"

SCALE: 3"=1'-0"

WINDOW SILL SCALE: 3"=1'-0"



SILL DETAILS

SCALE: 3"=1'-0"

GRAPHIC SCALES

¼"=1'-0"

3"=1'-0"

ELECTRICAL SYMBOLS

- ○ — LIGHT
- ⊖ — DUPLEX RECEPTACLE
- S — SWITCH

NOTES:

1. CEILING FIXTURE SHALL BE PORCELAIN SOCKET RECEPTACLE, KEYLESS WITH SHADE HOLDER GROOVE & 12" SHALLOW DOME REFLECTOR. MOUNT ON CEILING JOIST.
2. SWITCH & RECEPTACLE TO BE MOUNTED 48" ABOVE FLOOR.
3. ALL ITEMS ON THIS SHEET ARE TO BE PAID FOR UNDER ITEM NO. 9E

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

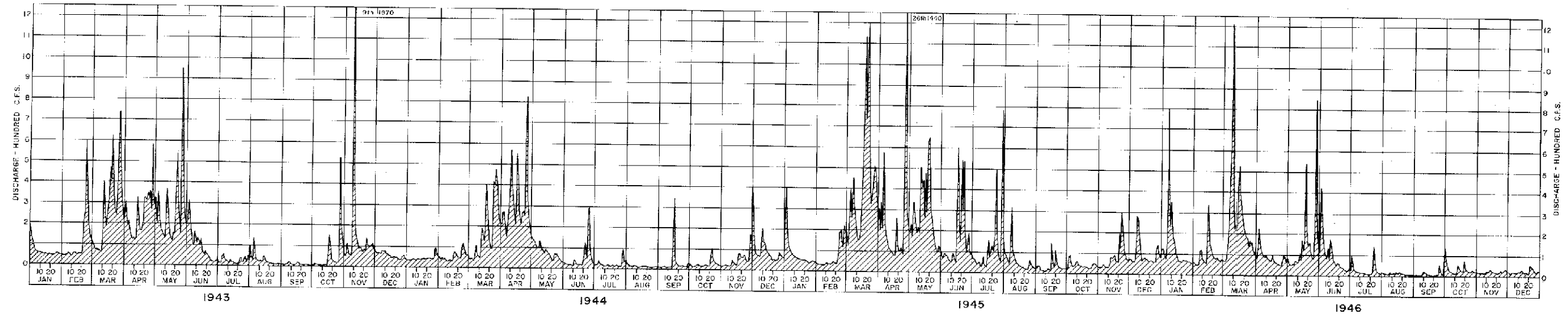
DES. BY J.S.	DR. BY C.M.A.	CK. BY J.
SUBMITTED	CHIEF, ARCH. SECTION	
PROJECT ENGINEER		
APPROVAL RECOMMENDED	CHIEF, DESIGN BRANCH	
APPROVAL RECOMMENDED	CHIEF, BRANCH	
APPROVED	CHIEF, ENGINEERING DIVISION	DATE MARCH 1962

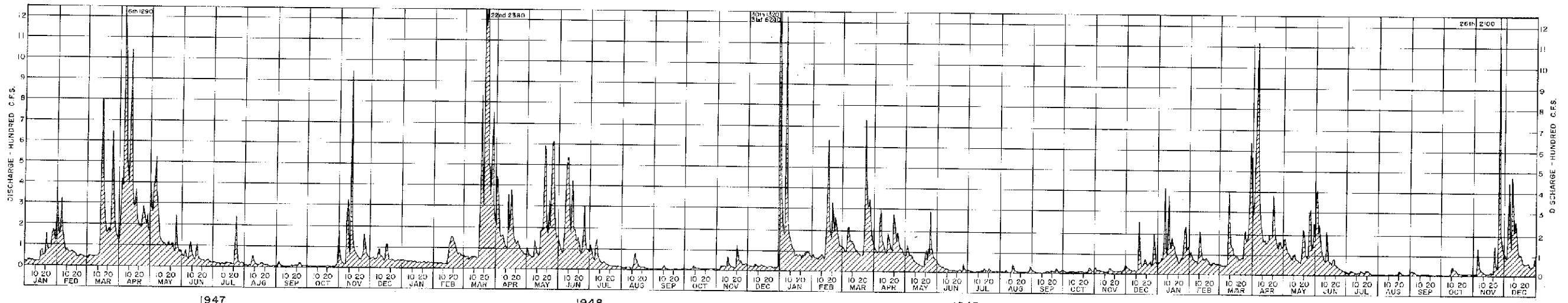
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
GARAGE
PLANS, ELEVATIONS, SECTIONS AND DETAILS
MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

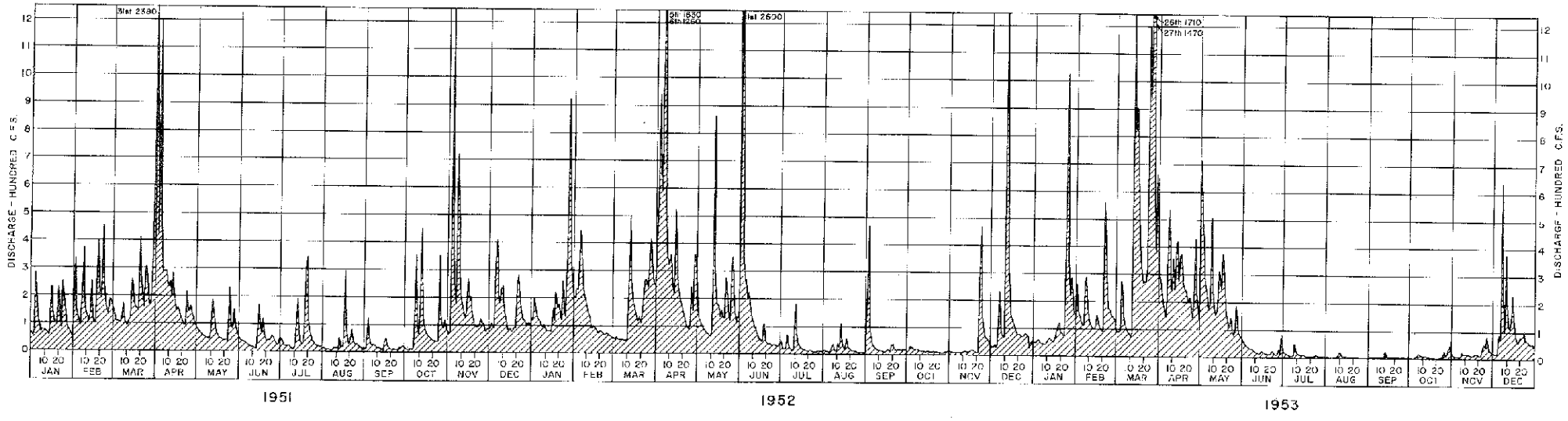
SCALE AS SHOWN | SPEC. NO. CIVENG. 9-018-62-48
DRAWING NUMBER CT-1-5817
SHEET 111

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warrantees but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
R.V.B.		E.P.S.

SUBMITTED: CHIEF, HYD. & HYD. SECTION
PROJECT ENGINEER

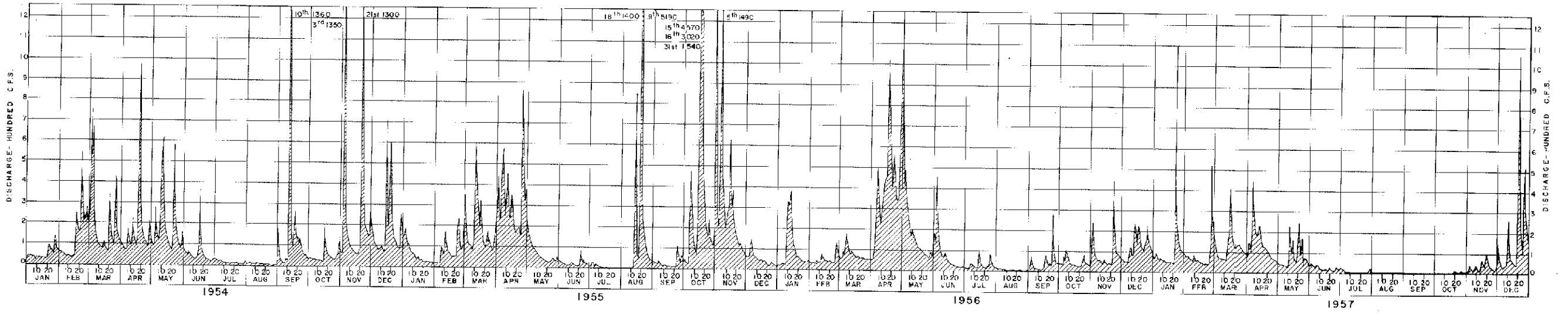
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE RESERVOIR
HYDROGRAPHS NO. 4
MIDDLE BRANCH WESTFIELD RIVER, MASS.

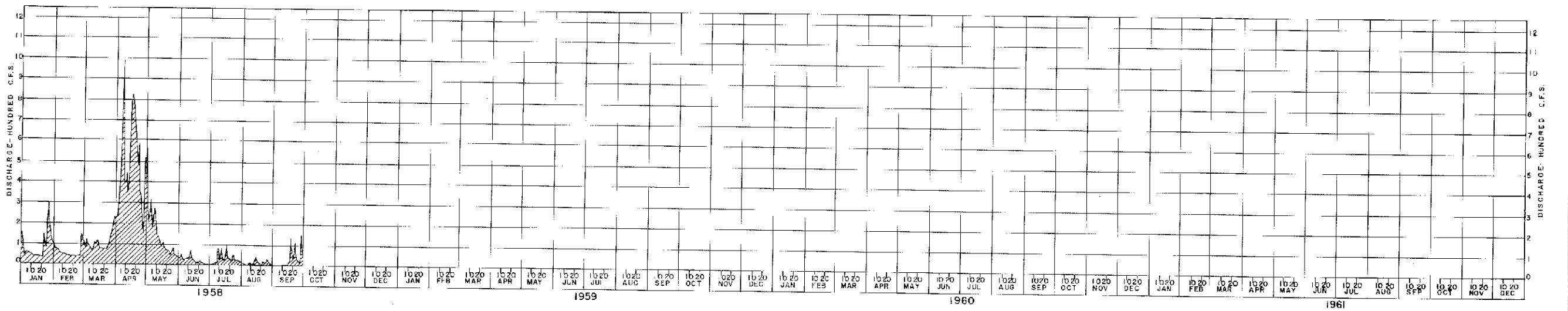
APPROVED RECOMMENDED: CHIEF R & L BRANCH
APPROVED: CHIEF ENGINEERING DIVISION
DATE

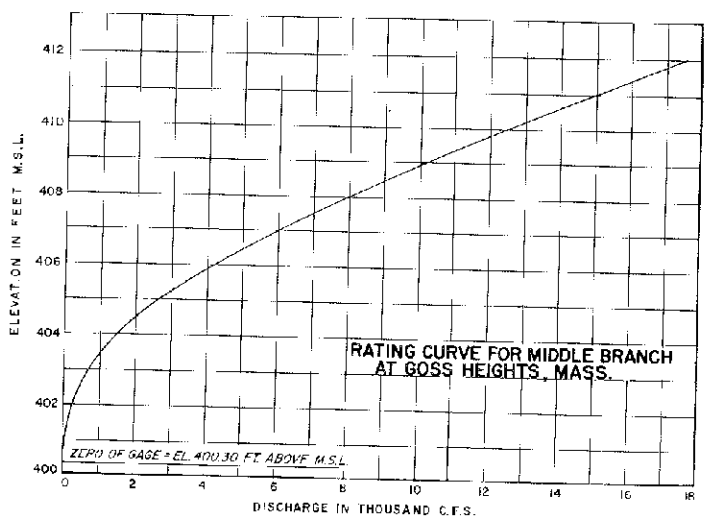
SCALE AS SHOWN | SPEC. NO. C V ENG.-9-018-64 (1-45)
DRAWING NUMBER
CT-1-5729
SHEET 5

CORPS OF ENGINEERS

U. S. ARMY







NOTES

1. These hydrographs are the daily average stream flow record of Middle Branch Westfield River, Goss Heights, Massachusetts from the tributary drainage area of 52.6 Square Miles.

2. Instantaneous peak discharges are shown where available.

3. The data contained herein are not intended as representations or warranties but are furnished for information only. It is expressly understood that the government will not be responsible for any deductions, interpretations or conclusions therefrom made by any bidder or contractor.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
R.J.B		E.P.S.

SUPERVISED
E. F. Chelius
CHIEF, HYD. & HYP. SECTION

PROJECT ENGINEER

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE RESERVOIR

HYDROGRAPHS NO. 5

MIDDLE BRANCH WESTFIELD RIVER, MASS.

RECOMMENDED
CHIEF, ENGINEERING BRANCH

APPROVED
CHIEF ENGINEERING DIVISION

DATE MAY 20 1963

SCALE AS SHOWN | SPEC. NO. CIVENG-19-016-63-99

DRAWING NUMBER
CT-1-5730

SHEET 7

MODERN BLUE PRINT CO., INC. BOSTON, MASS.

CORPS OF ENGINEERS

U. S. ARMY

PLAN

SCALE IN FEET

100' 0 100' 200

LEGEND

- FD Foundation Test Boring
- FT Foundation Test Pit
- Bedrock Outcrop
- Boulder or Rock Block
- 70° Strike and Dip of Foliation
- 3 3 Location and Direction of View for Geologic and Geologic-Log Sections

NOTES

Elevations refer to Mean Sea Level Datum. Contour interval equals 5 feet.

Origin of Coordinates is a local grid. County Bound of Hampden and Hampshire is N50,000 - E30,000

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
P.A.V.	L.H.L.	H.C.K.

SUBMITTED: Chief, Hydrology & Geology Section

PROJECT ENGINEER

APPROVED / RECOMMENDED: Chief, Design Branch

APPROVED / RECOMMENDED: Chief, Engineering Branch

APPROVED: Chief, Engineering Division

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

PLAN OF FOUNDATION EXPLORATIONS

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

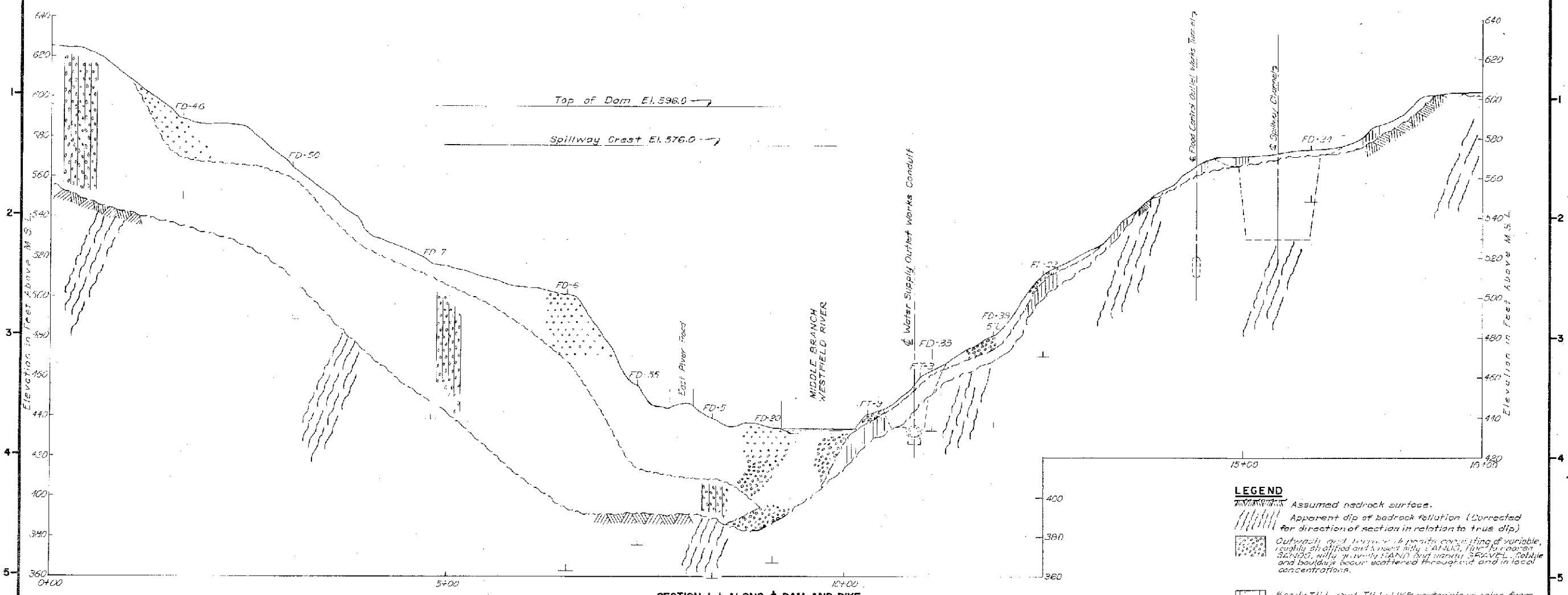
DATE: MARCH 1962

SCALE AS SHOWN | SPEC. NO.

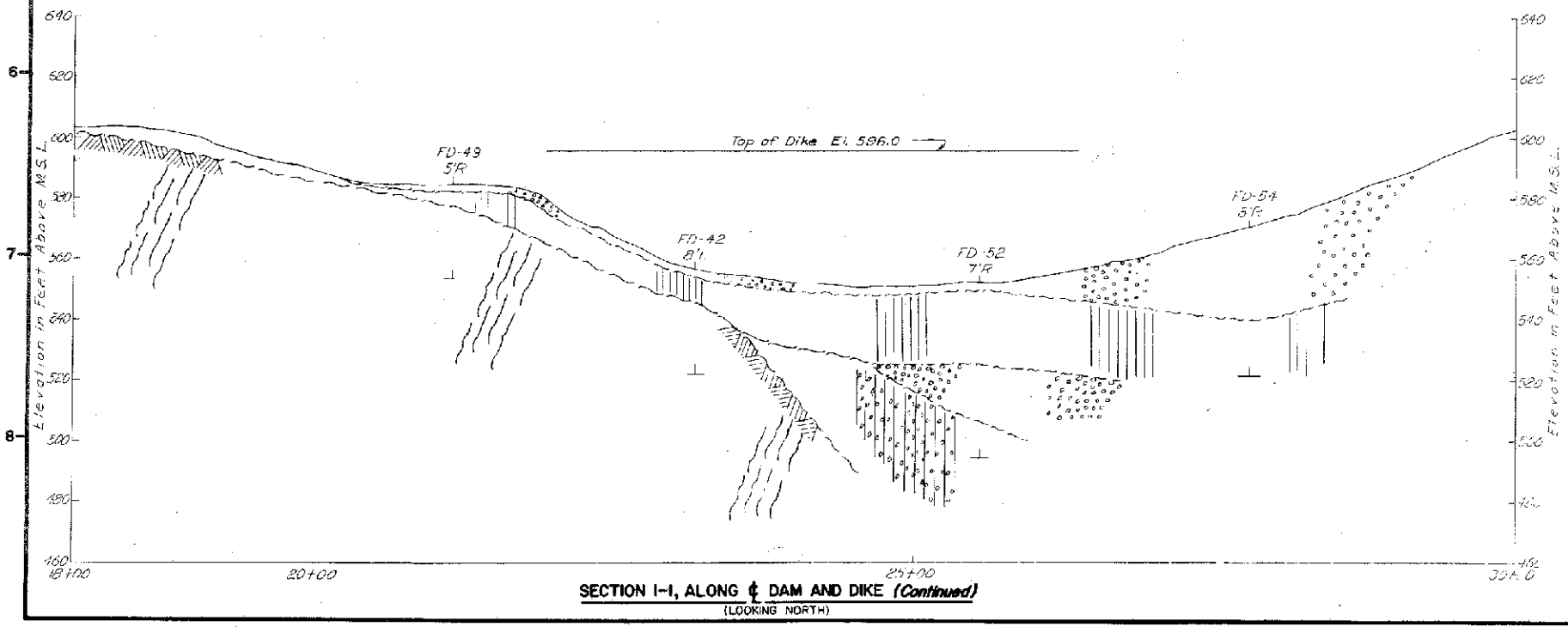
DRAWING NUMBER: CT-2-1492

SHEET 8

CORPS OF ENGINEERS — U. S. ARMY



SECTION I-I, ALONG ℄ DAM AND DIKE
(LOOKING NORTH)



SECTION I-I, ALONG ℄ DAM AND DIKE *(Continued)*
(LOOKING NORTH)

LEGEND

Assumed bedrock surface.

Apparent dip of bedrock foliation (Corrected for direction of section in relation to true dip)

Outwash and Terrace deposits consisting of variable, roughly stratified and lenticular silty SAND, fine to coarse SAND, silty gravelly SAND and locally GRAVEL, cobble and boulders occur scattered throughout and in local concentrations.

Sandy TILL and TILL-LIKE materials ranging from gravelly SAND and silty, sandy GRAVEL to gravelly silty SAND. Cobbles and boulders occur scattered throughout and in local concentrations. Also includes some zones of weathered bedrock.

TILL - Variable gravelly, silty SAND, with numerous cobbles and boulders

Bedrock consists mainly of graphitic and locally calcareous quartz albite SCHIST with many thin beds of quartzitic, biotite and hornblend SCHIST.

NOTES

For Location of Sections, see Sheet No. 8
For Record of Foundation Explorations, see Sheet Nos. 14, 15, 16, 17, 18 and 19.

These geologic sections are presented for general information and are to be considered only as a supplement to the records of explorations, and other contract drawings. Geologic sections shown hereon are the Government interpretation of subsurface conditions believed to exist at and between borings. Variations between elevations, composition and structure of the individual formations as represented hereon and as actually encountered in the progress of work are to be anticipated.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

W.S. BY	DR. BY	CH. BY
H.A.V.	H.T.B.	H.A.V.

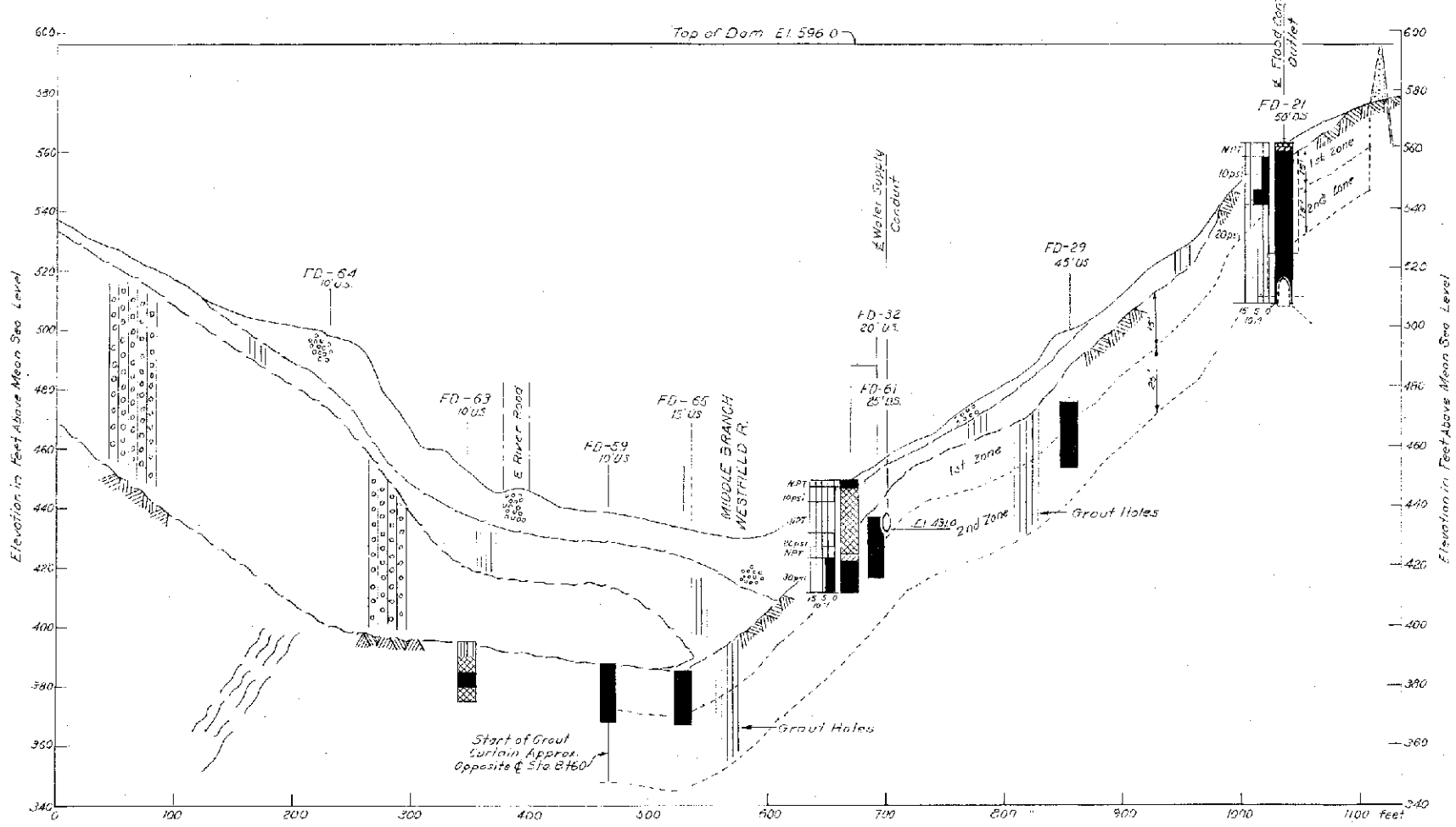
SUBMITTED
HEAD, DESIGN SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FOUNDATIONS BRANCH
APPROVAL RECOMMENDED
CHIEF, SOILS & ROCKS BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
DAM AND DIKE
GEOLOGIC SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

SCALE AS SHOWN SPEC. NO. CT-LNG-12-DIK-62-49
DRAWING NUMBER
CT-2-1493
SHEET 9

CORPS OF ENGINEERS

U.S. ARMY

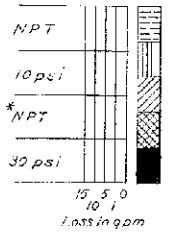


SECTION 2-2

(LOOKING UPSTREAM)

LEGEND FOR CORE BORING IN ROCK

FD-32 Foundation Test Boring
20' U.S. Distance and direction of offset



0-25% Rock core recovery
25-50% Rock core recovery
50-75% Rock core recovery
75-90% Rock core recovery
90-100% Rock core recovery

*NPT 20psi — No pressure test performed. Asterisk denotes that section could not be sealed for testing. Constantly maintained pressure for 1 to 5 minutes. Volume loss in gallons per minute under constant pressure, tested continuously in 5-foot sections. Scale expanded from 0 gpm to 1 gpm for clarification of low pressure losses.

NOTES

For Location of Section, see Sheet No. 8
For Record of Foundation Explorations, see Sheet No's 14, 15, 16, 17, 18, and 19.
For Legend of Geologic Symbols, see Sheet No. 3
For notes applicable to Geologic Sections, see Sheet No. 9

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CH. BY
H.A.V.	R.A.W.	H.A.V.

SUBMITTED
H.A.V. GEOLOGIST, SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FOR & MAPS BRANCH
APPROVAL RECOMMENDED
CHIEF, PLAN & REPTS BRANCH

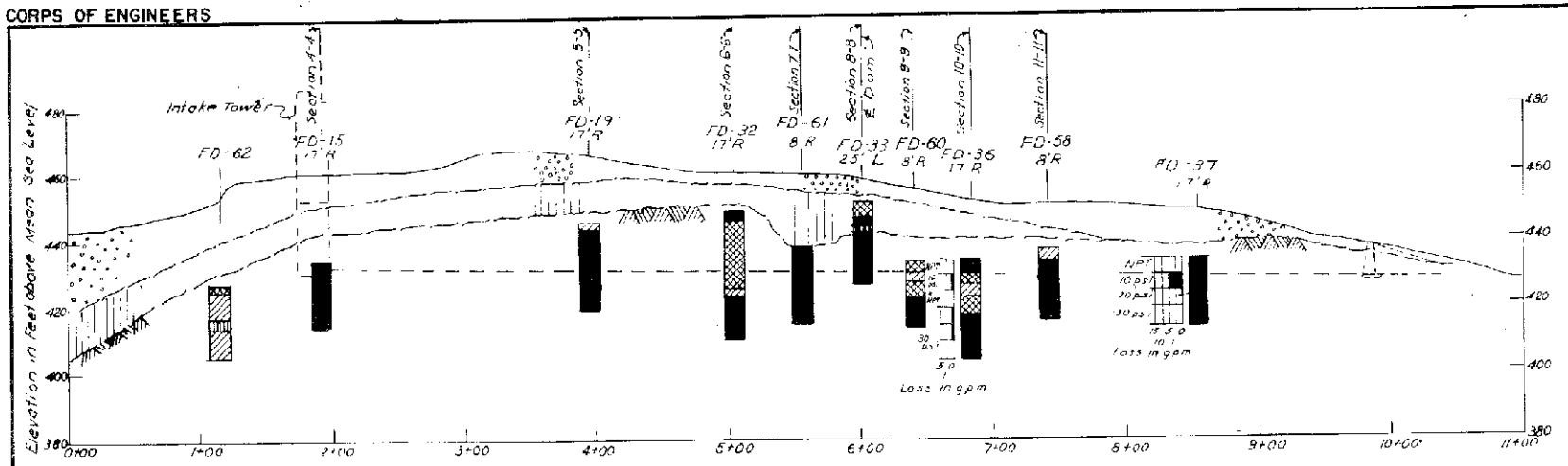
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
CUT-OFF TRENCH
GEOLOGIC-LOG SECTION
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

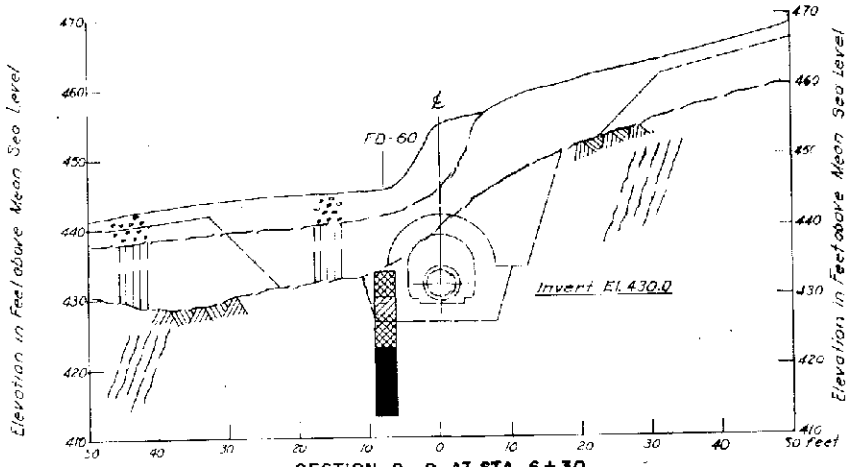
SCALE AS SHOWN
SPEC. NO. CIV. ENG 19-016-62-43
DRAWING NUMBER
CT-2-1494
SHEET 10

CORPS OF ENGINEERS

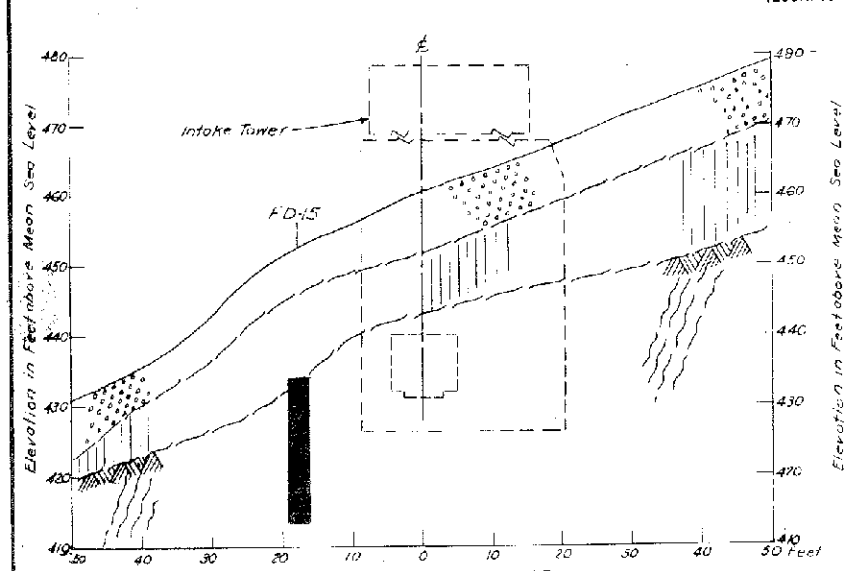
U.S. ARMY



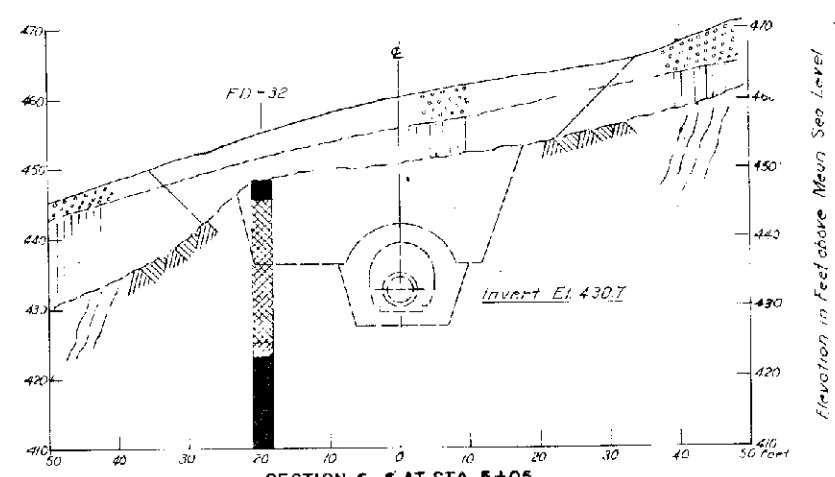
SECTION 3-3, ALONG ℄ WATER SUPPLY OUTLET WORKS
(LOOKING EAST)



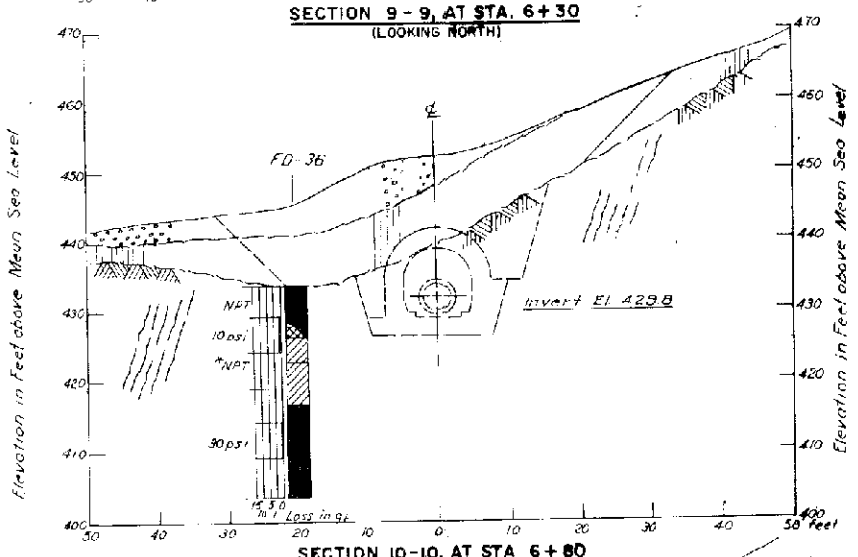
SECTION 9-9, AT STA. 6+30
(LOOKING NORTH)



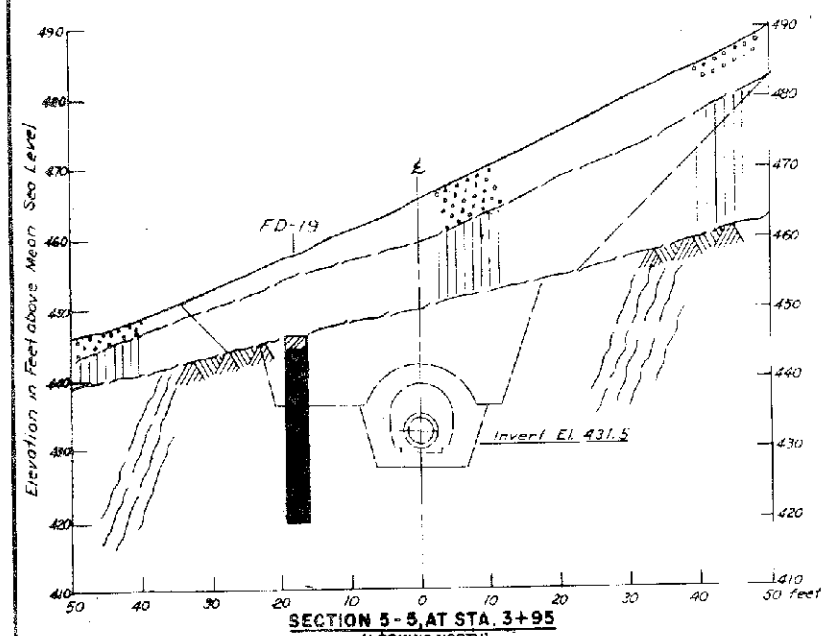
SECTION 4-4, AT STA. 1+95
(LOOKING NORTH)



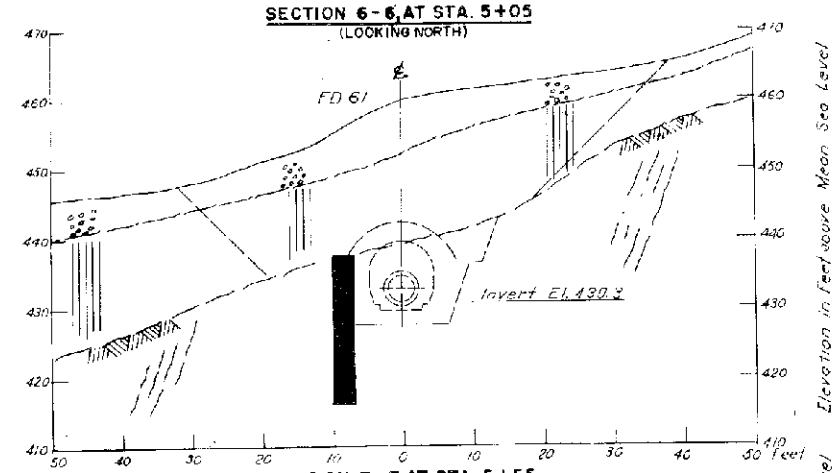
SECTION 6-6, AT STA. 5+05
(LOOKING NORTH)



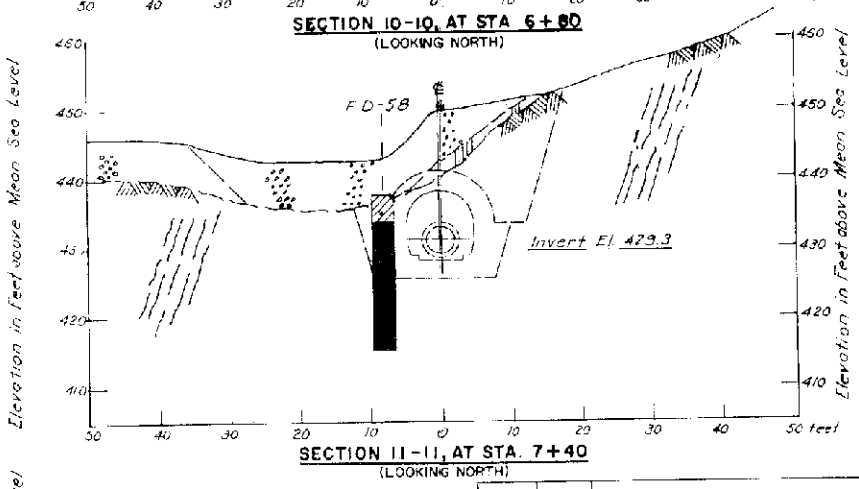
SECTION 10-10, AT STA. 6+80
(LOOKING NORTH)



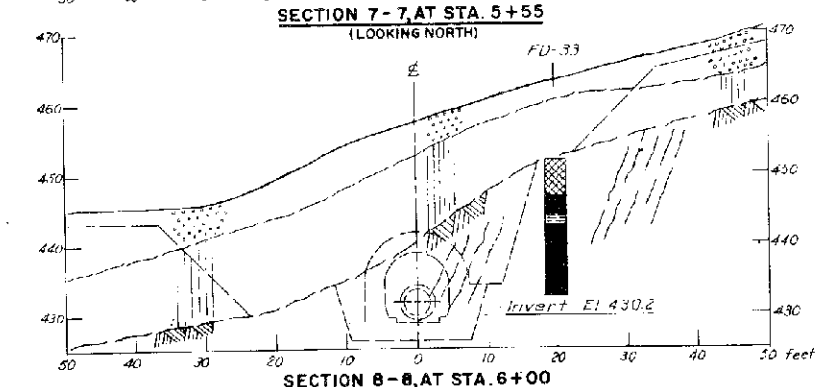
SECTION 5-5, AT STA. 3+95
(LOOKING NORTH)



SECTION 7-7, AT STA. 5+55
(LOOKING NORTH)



SECTION 11-11, AT STA. 7+40
(LOOKING NORTH)



SECTION 8-8, AT STA. 6+00
(LOOKING NORTH)

NOTES

For location of Sections, Sheet No. 8
For Record of Foundation Explorations, see Sheet Nos. 14, 15, 16, 17, 18 and 19.
For Legend of Geologic Symbols, see Sheet No. 9
For notes applicable to Geologic Sections, see Sheet No. 9
For Legend of Core Boring in Rock, see Sheet No. 10

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. | DR. BY R.A.W. | CK. BY H.A.V.

SUBMITTED
CHIEF, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, FOR. & HAT. S. BRANCH

APPROVAL RECOMMENDED
CHIEF, PLANNING BRANCH

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
WATER SUPPLY OUTLET WORKS
GEOLOGIC-LOG SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION

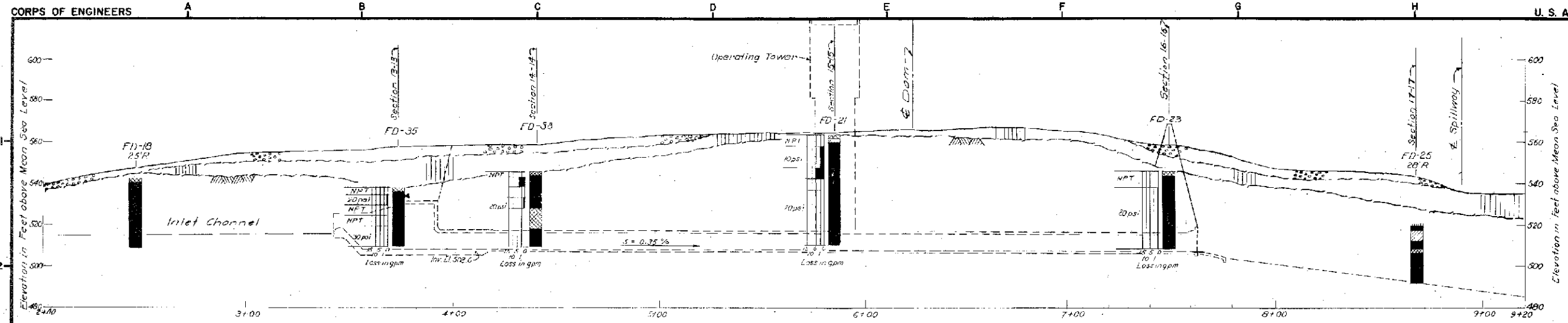
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. DIVISION GIS 62-49

DRAWING NUMBER
CT-2-1495

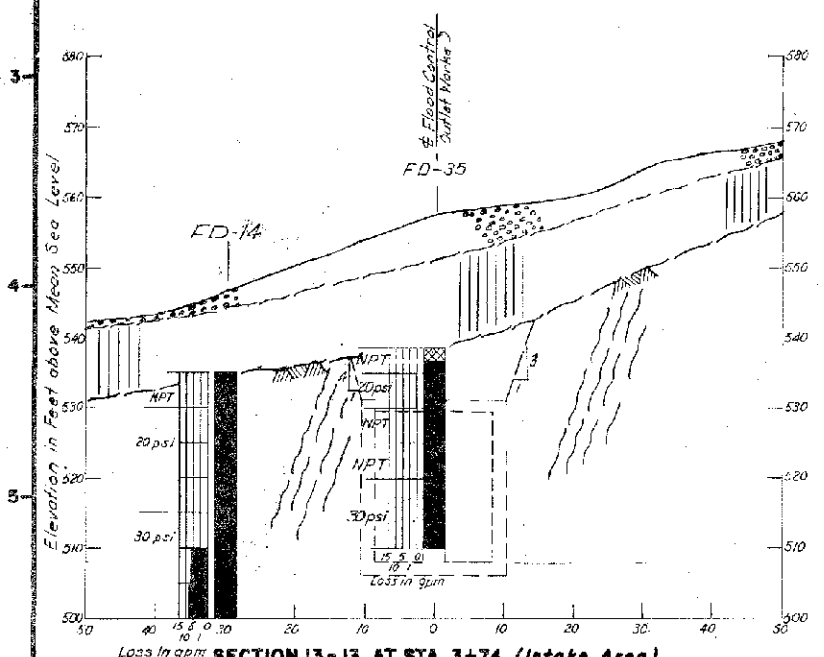
SHEET 11

CORPS OF ENGINEERS — U. S. ARMY



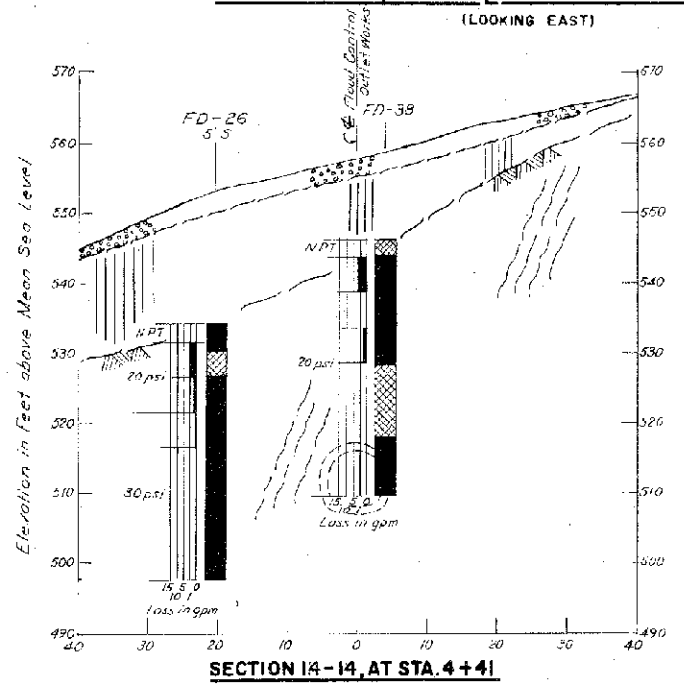
SECTION 12-12, ALONG ℄ FLOOD CONTROL OUTLET WORKS

(LOOKING EAST)



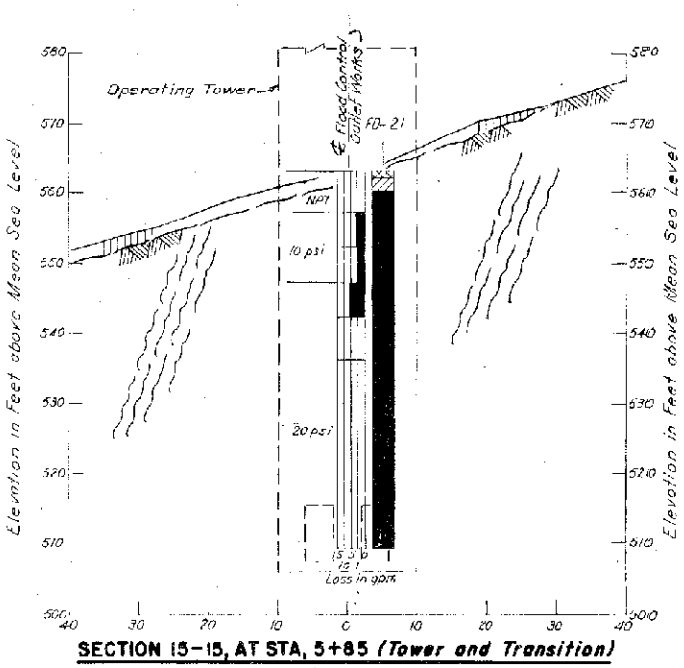
SECTION 13-13, AT STA. 3+74 *(Intake Area)*

(LOOKING NORTH)



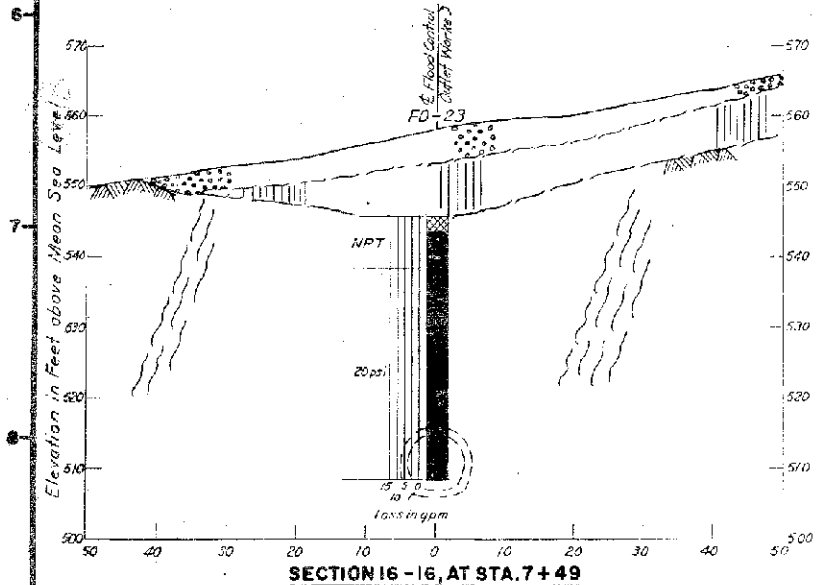
SECTION 14-14, AT STA. 4+41

(LOOKING NORTH)



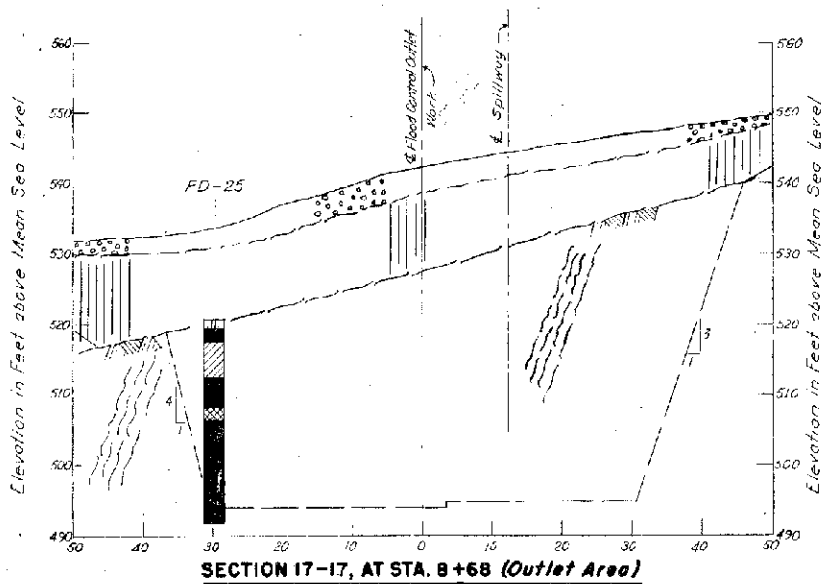
SECTION 15-15, AT STA. 5+85 *(Tower and Transition)*

(LOOKING NORTH)



SECTION 16-16, AT STA. 7+49

(LOOKING NORTH)



SECTION 17-17, AT STA. 8+68 *(Outlet Area)*

(LOOKING NORTH)

NOTES

For Location of Sections, see Sheet No. 8
For Record of Foundation Explorations, see Sheet Nos. 14, 15, 16, 17, 18 and 19
For Legend of Geologic Symbols, see Sheet No. 9
For notes applicable to Geologic Sections, see Sheet No. 9
For Legend of Core Boring in Rock, see Sheet No. 10

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.W. | DR. BY R.A.W. | CK. BY H.A.V.

SUBMITTED: H. C. Handy, CHIEF, GEOLOGY SECTION
PROJECT ENGINEER: H. A. Wadlow
APPROVAL RECOMMENDED: Chief, Hydr. & Hydrol. Branch
APPROVED: Chief, Engineering Division

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
FLOOD CONTROL OUTLET WORKS
GEOLOGIC-LOG SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

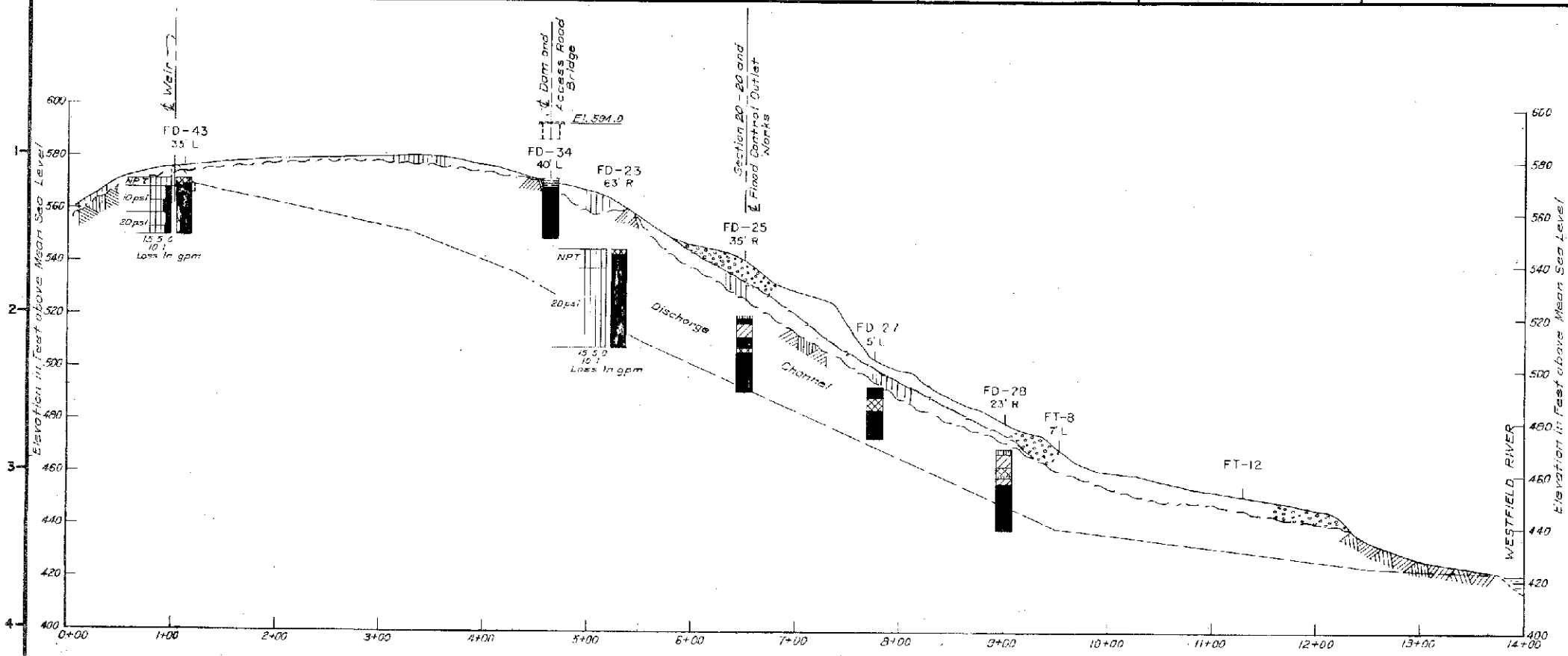
DATE MARCH 1962

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-2-1496

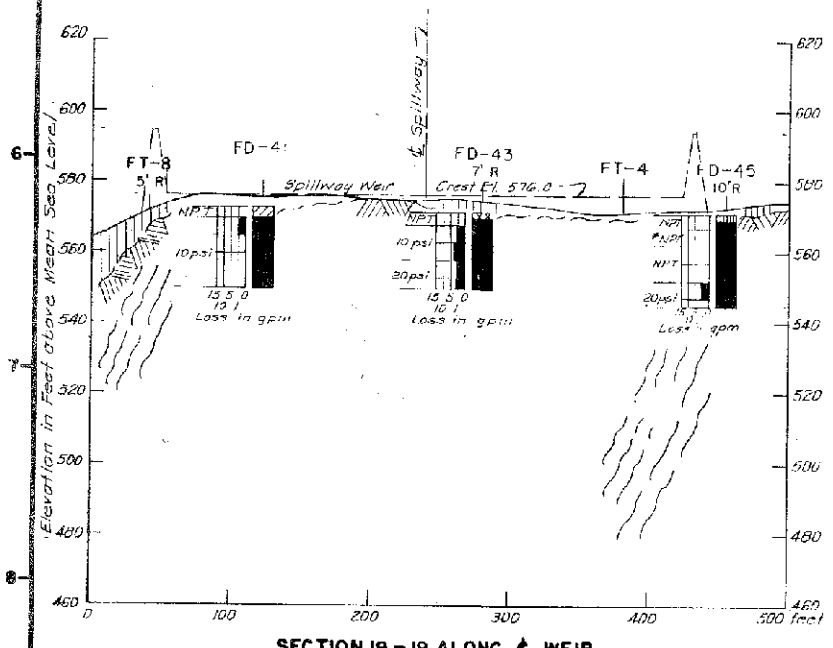
SHEET 12

CORPS OF ENGINEERS — U. S. ARMY



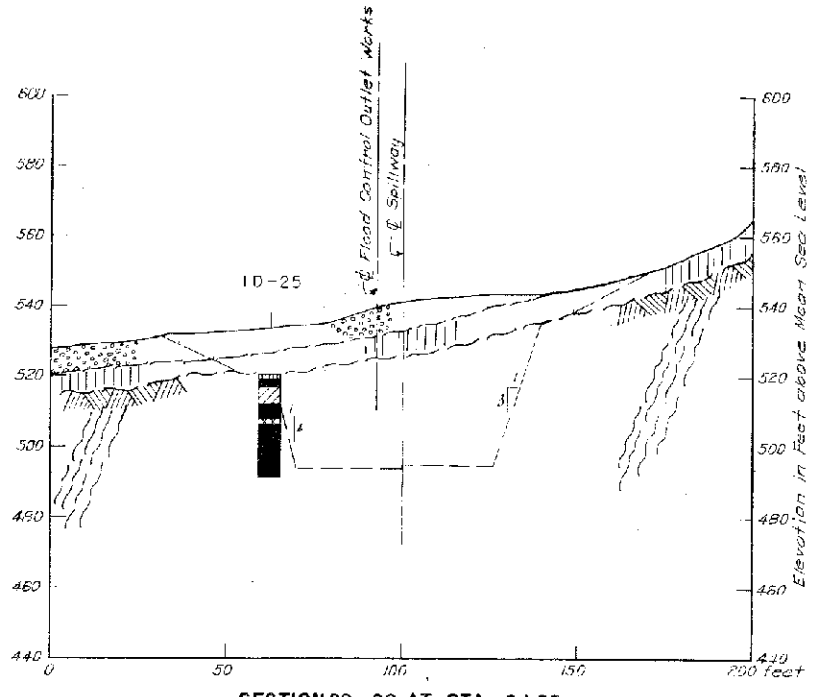
SECTION 18 – 18, ALONG ℄ SPILLWAY

(LOOKING EAST)



SECTION 19 – 19, ALONG ℄ WEIR

(LOOKING NORTH)



SECTION 20 – 20, AT STA. 6+50

(LOOKING NORTH)

NOTES

For Location of Sections, see Sheet No. 8
For Record of Foundation Explorations see Sheet No's 14, 15, 16, 17, 18 and 19.
For Legend of Geologic Symbols, see Sheet No. 9
For notes applicable to Geologic Sections, see Sheet No. 9
For Legend of Core Boring in Rock, see Sheet No. 10

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.A.V.	R.D.B.	H.A.V.

SUBMITTED: for Staley
HEAD, GEOLOGY SECTION
PROJECT ENGINEER: Hatton
APPROVAL RECOMMENDED: Chief, Civil & Military Branch
APPROVAL RECOMMENDED: Chief, Planning & Reports Branch

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
SPILLWAY
GEOLOGIC-LOG SECTIONS
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED: Chief, Engineering Division
DATE: MARCH 1962

SCALE AS SHOWN | SPEC. NO. Div. Eng. 19-019-62-49
DRAWING NUMBER: CT-2-1497
SHEET 13

CORPS OF ENGINEERS — U. S. ARMY

DEPTH IN FEET

FD-1
4 JAN. 1956
El. 553.2

- Forest Debris
- Silty SAND with roots and gravel
- Silty, sandy coarse to medium GRAVEL
- Silty, gravelly SAND
- Silty medium to fine SAND
- Gravelly, silty SAND
- Fine sandy SILT
- Silty, gravelly SAND
- Silty medium to fine SAND
- Gravelly, silty medium to fine SAND
- Silty, fine SAND
- Silty, gravelly SAND
- Decomposed rock or cobbles
- NS El. 503.2

Refusal at 50.4

FD-2
31 JAN. 1956
El 503.5

- Forest Debris
- Silty SAND with organics
- Gravelly, silty SAND (TILL) (slightly micaceous)
- Silty, gravelly SAND (TILL)
- Cobbles and decomposed rock fragments
- Silty gravelly SAND with rock fragments El. 456.2

SCHIST, mica; Light gray, fine-grained, moderately soft. Foliation dips at approximately 60°. Generally fresh except 1 weathered zones at 18.5' and 26.5'; Open seam at 28.5'. Slickensided fracture at 34.5' to 36.5'. Mostly sericite mica with some biotite, Garnet disseminated throughout. Pyrite occurs in fracture zone El. 439.5

FD-3
3 FEB. 1956
El 534.0 TOPSOIL

- Gravelly, silty medium to fine SAND (TILL)
- Silty, medium to fine SAND (TILL)
- Gravelly, silty medium to fine SAND (TILL)

El. 503.5

SCHIST, mica; Light gray, fine-grained, fresh, moderately soft. Foliation dips 45° to 60°. Granitized zones at 22.2' and 32.2'. Slightly weathered zone occasional foliation planes and in zones at approximately 39' and 40'. Mostly sericite schist with biotite; garnet occurs in granitized zones.

El. 482.6

FD-4
8 FEB. 956
El 536.0 TOPSOIL

- Silty medium to fine SAND with roots
- Gravelly, silty medium to fine SAND

El. 526.8 Silty SAND

SCHIST, mica; Light gray, fine-grained, soft foliation dips of approximately 60°, generally fresh except in weathered seams along open foliation planes and joints at 90' to 9.5', 15.0', 17.5', 18.0', 19.5', 23.0', 24.0' to 27.0', 29.0' to 36.0' and 41.5'. Moderately sericite with much biotite. Talc noted in some foliation planes. Garnet disseminated throughout.

El. 489.5

FD-5
25 FEB. 1956
El 493.6

- Silty, fine SAND with roots
- Silty, fine SAND
- Silty, sandy GRAVEL with cobbles
- Sandy GRAVEL
- Silty sandy GRAVEL
- Gravelly, silty SAND
- Gravelly silty medium to fine SAND (TILL)
- Silty SAND (TILL)
- Gravelly, silty medium to fine SAND
- Silty gravelly SAND with cobbles
- Sandy Gravel with cobbles
- Cobble fragments

El. 393.0

SCHIST, mica; Light gray, fine-grained, hard, fresh. Predominantly sericite schist to approximately 60°, quartz-mica schist to approximately 75° and sericite schist to bottom of hole at 80°. Boundaries between types are gradational. Quartz-mica schist is locally granitized. Biotite occurs throughout. Rock weathered from surface to 5.4' and thereafter only slightly along occasional foliation planes and joints. Foliation dips approximately 70°.

El. 359.6

FD-6
13 MAR. 1956
El 501.3

- Silty, medium to fine SAND with organics
- Silty, sandy GRAVEL with cobbles
- Silty, gravelly SAND with cobbles
- Silty, sandy GRAVEL with cobbles
- Silty medium to fine SAND with cobbles
- Medium to fine sandy Silt
- Silty, medium to fine SAND
- Gravelly, silty medium to fine SAND with cobbles (TILL)
- Medium to fine sandy SILT
- Medium to fine sandy SILT with cobbles (TILL)
- NS
- Gravelly silty SAND with cobbles (TILL)
- Silty medium to fine SAND with cobbles (TILL)
- Silty, gravelly SAND with cobbles (TILL)
- NR
- Silty, medium to fine SAND with cobbles (TILL)
- Gravelly, silty medium to fine SAND (TILL)
- Silty, gravelly SAND with cobbles
- Gravelly silty SAND (TILL)
- GRAVEL with cobble fragments

El. 358.7

SCHIST, quartz-mica. Dark gray, fine-grained, fresh. Quartz dike from 124.6' to 125.0'. Rock softer and badly broken in weathered zone from 130.5' to 134.3'. Scattered pyrite and garnet. Foliation dips at approximately 60°.

El. 363.2

LEGEND FOR GRAPHIC LOGS

FD	Foundation Test Boring
FT	Foundation Test Pit
BD	Borrow Test Boring
BA	Borrow Hand Auger boring
BT	Borrow Test Pit
(OW)	Observation Well installed
3 FEB '956	Date excavation completed
El. 534.0	Elevation of ground surface during time of exploration

- Maximum artesian head
- Subsurface water level in boring at time of exploration
- Range of subsurface water during period of observation
- Artesian flow encountered
- Group letter symbol according to Unified Soil Classification System
- NR No Recovery or unsatisfactory soils samples recovered
- NS Not Sampled. Hole advanced by Core-drilling, blasting and/or wash boring due to operational difficulty
- Bottom of observation well
- Sampling in overburden by Core drilled method
- Blows per foot of penetration considered most representative for each sample drive using a 350 pound hammer with a free fall of about 18" on a 1⅜" I.D. or 2" O.D.; 2" I.D. or 2½" O.D. and/or 2½" I.D. or 3" O.D. size sample spoon equipped with a beveled and sharpened drive shoe.
- Blow counts not recorded or not considered representative
- Cobble or boulder (Core-drilled)
- Cobbles or boulders, continuous or nested (Core-drilled and/or blasted and chopped)
- El. 920.2 Elevation of Bedrock surface
- Rock symbol
- Rock core recovery 0-25%
- Rock core recovery 25-50%
- Rock core recovery 50-75%
- Rock core recovery 75-90%
- Rock core recovery 90-100%

NPT 40 psi — Loose to open 15.0-15.5 ft. 40 psi

No pressure test performed. Asterisk denotes that section could not be sealed for testing.
Constantly maintained pressure for 1 to 5 minutes. Volume loss in gallons per minute under constant pressure, tested continuously in 5-foot sections. Scale expanded from 0-gpm to 1-gpm for clarification of low pressure losses.

Water levels recorded during subsurface explorations seldom correspond with natural level of free ground water except in extensive and thick deposits of sands and gravels which are sufficiently pervious to permit rapid stabilization of water levels in the exploratory hole. Absence of subsurface water in the graphic log of any exploration is not necessarily to be construed that ground water will not be encountered in excavation at that location.

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local minor variations characteristic of the overburden and rocks of this region are anticipated and if encountered, such variations will not be considered as differing "materially" from represented conditions within the purview of Article 4 of the Contract.

FD-7
6 APRIL 1956
El 517.0

- TOPSOIL
- Silty, gravelly SAND with roots
- Silty, gravelly SAND with cobbles
- Silty, gravelly SAND with cobbles
- Gravelly, silty SAND
- Sandy SILT with cobbles
- Silty, medium to fine SAND with gravel (TILL)
- Silty gravelly SAND with cobbles (TILL)
- Gravelly, silty SAND with cobbles (TILL)
- Gravelly SAND (TILL)
- Silty, gravelly SAND with cobbles (TILL)
- Gravelly, silty SAND with cobbles (TILL)
- Sandy GRAVEL with cobbles (TILL)
- Sandy GRAVEL with cobbles (TILL)
- Silty, gravelly SAND with cobbles (TILL)
- Silty, gravelly SAND (TILL)
- Decomposed Rock

El. 430.7

FD-8
3 FEB 1960
El 533.3

- Medium to fine Sandy SILT with roots
- Silty SAND (TILL)
- Gravelly silty SAND (TILL)
- Silty sandy GRAVEL (TILL)
- Weathered Rock
- Gravelly, silty SAND with cobbles (TILL)
- NS
- Silty sandy GRAVEL with cobble (TILL)
- Gravelly, silty, medium to fine SAND with cobbles (TILL)
- Gravelly silty SAND with cobbles (TILL)
- Silty sandy GRAVEL (TILL)
- Silty medium to fine SAND (TILL)
- Silty medium to fine SAND (Weathered Rock)
- NS Weathered and decomposed rock

El. 484.3

SCHIST, mica; foliation granitized, light to dark gray, medium to fine-grained, moderately soft to hard, locally distinct foliation dipping 60°. Weathered 53.7' to 54.0' and 56.9' to 62.0'.

El. 454.3

FD-9
8 FEB 1960
El 557.0

- Forest debris
- Medium to fine sandy SILT
- Silty, gravelly SAND (TILL)
- Gravelly, silty SAND (TILL)
- Silty, sandy GRAVEL (TILL)
- NS
- Medium to fine SAND (TILL)
- Weathered and decomposed

El. 535.8 Rock

SCHIST, sericite-biotite, dark gray, fine-grained, generally hard and solid. Foliation dips 65° to 70°. Altered zones 28.2' to 30.5' and 38.8' to 40.3'. Open near-vertical seams at 25.0', 30.1' and 40.5'. Occasional low to medium angle, open oxidized joints. Weathered zones 31.6' to 33.4' and 34.2' to 34.8'. Salt in foliation parting 34.8'. Garnets disseminated throughout.

El. 516.5

FD-10
16 FEB 1960
El 575.0

- TOPSOIL with organics
- Silty, medium to fine SAND with cobbles (TILL)
- Gravelly, silty, medium to fine SAND (TILL)
- Gravelly, silty SAND (TILL)
- Silty gravelly, medium to fine SAND (TILL) and weathered Rock)

El. 538.4

MICA SCHIST, gray, generally fresh, coarse. High angle, thin foliation becoming indistinct with depth. Granitized zone from 8.2' to 9.8'. Numerous medium to low angle, open joint fractures throughout. High angle, stained joints at 11.0', 16.2', 18.8' and 34.6' with clay filling in the one at 34.6'. Core in fragments to pieces up to 3.1' in length.

El. 537.8

FD-11
22 MAR 1960
El 604.0

- Sandy SILT, with roots (TOPSOIL)
- Silty, medium to fine SAND (TILL)
- Silty, gravelly, medium to fine SAND (TILL)
- Gravelly, silty, medium to fine SAND (TILL)

El. 598.3

MICA SCHIST, gray, generally fresh, coarse. High angle, thin foliation becoming indistinct with depth. Granitized zone from 8.2' to 9.8'. Numerous medium to low angle, open joint fractures throughout. High angle, stained joints at 11.0', 16.2', 18.8' and 34.6' with clay filling in the one at 34.6'. Core in fragments to pieces up to 3.1' in length.

El. 580.5

NOTES

Elevations refer to Mean Sea Level Datum.
For location of Foundation Explorations, see Sheet No. 8.
All test pits designated BT except BT-1 and BT-2 were excavated by ¾ yard backhoe. BT-1 and BT-2 were hand excavated.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CH. BY
H.A.V.	R.O.B.	H.A.V.

SUBMITTED: [illegible] HEAD, GEOLOGY SECT. OR
PROJECT ENGINEER
APPROVAL RECOMMENDED: [illegible] CHIEF, FOUNDATIONS BRANCH
APPROVAL RECOMMENDED: [illegible] CHIEF, PLANS & SPECS BRANCH
APPROVED: [illegible] CHIEF, ENGINEERING DIVISION
DATE: MARCH 1962

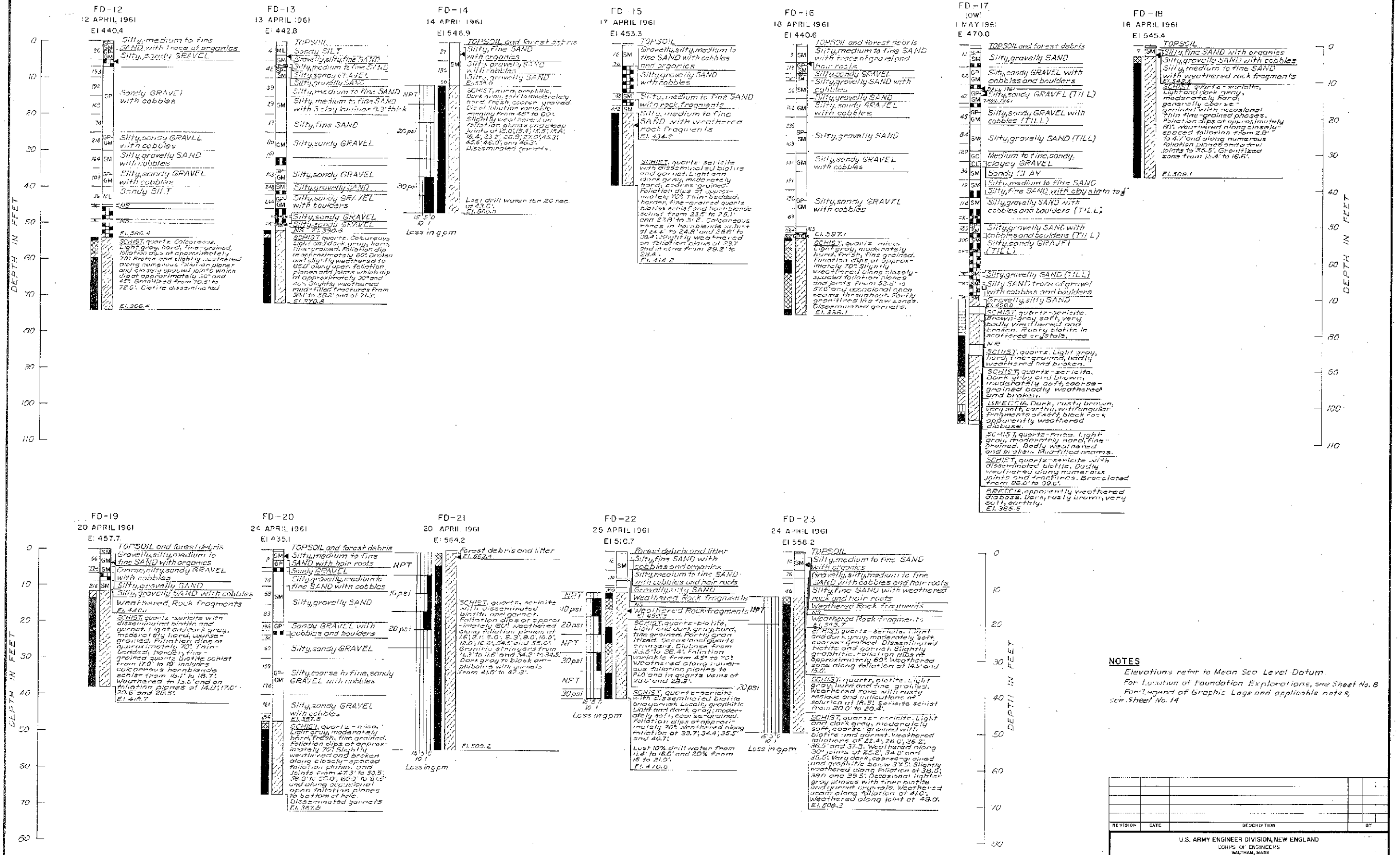
CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM
RECORD OF FOUNDATION EXPLORATIONS NO. 1
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

SCALE AS SHOWN | SPEC. NO. DIV. ENG. (B-6) 61-842
DRAWING NUMBER
CT-2-1498
SHEET 14

CORPS OF ENGINEERS

U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum.

For Location of Foundation Explorations, see Sheet No. 8

For Legend of Graphic Logs and applicable notes, see Sheet No. 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.A.V.	K.J.B.	H.A.V.

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HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FOUNDATION & MATERIALS BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM
RECORD OF FOUNDATION EXPLORATIONS NO. 2

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

DATE MARCH 1962

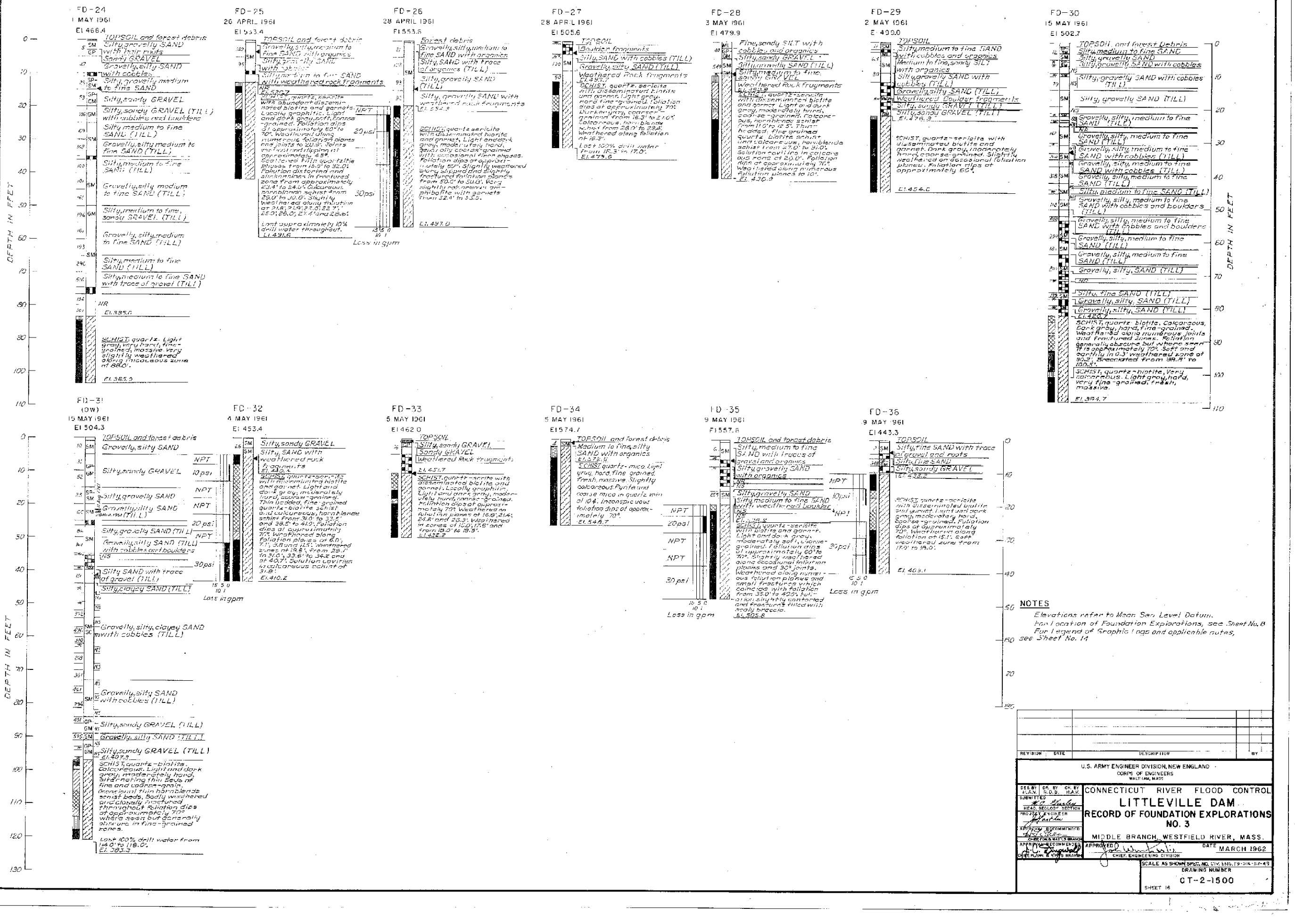
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DRAWING NUMBER
CT-2-1499

SHEET 15

CORPS OF ENGINEERS

U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum.
For location of Foundation Explorations, see Sheet No. 8
For Legend of Graphic Logs and applicable notes, see Sheet No. 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

DES. BY	DR. BY	CK. BY
H.A.V.	R.D.B.	H.A.V.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVED RECOMMENDED
CHIEF, PLANS & SPECS BRANCH
APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL

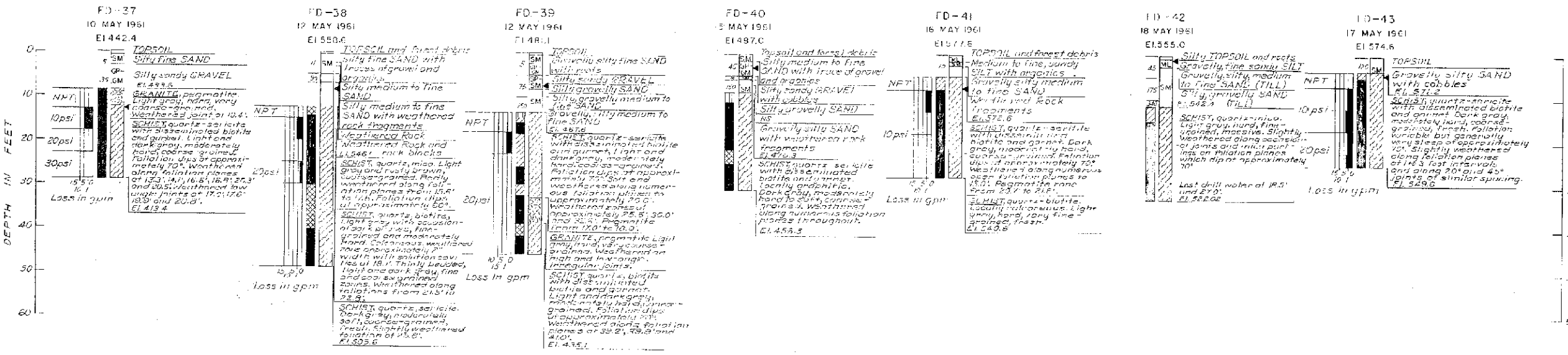
LITTLEVILLE DAM
RECORD OF FOUNDATION EXPLORATIONS NO. 3

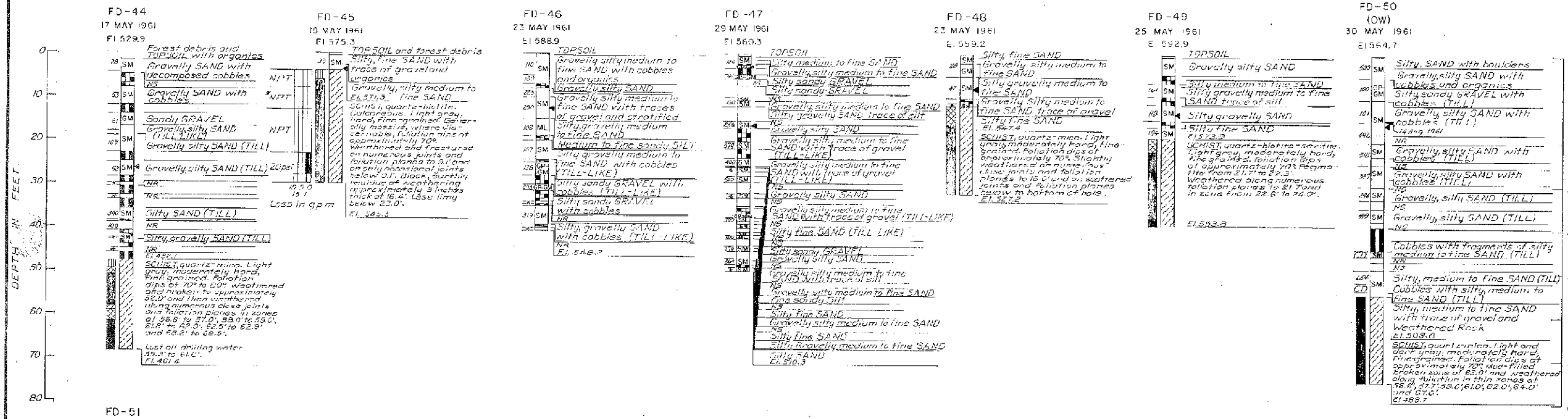
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

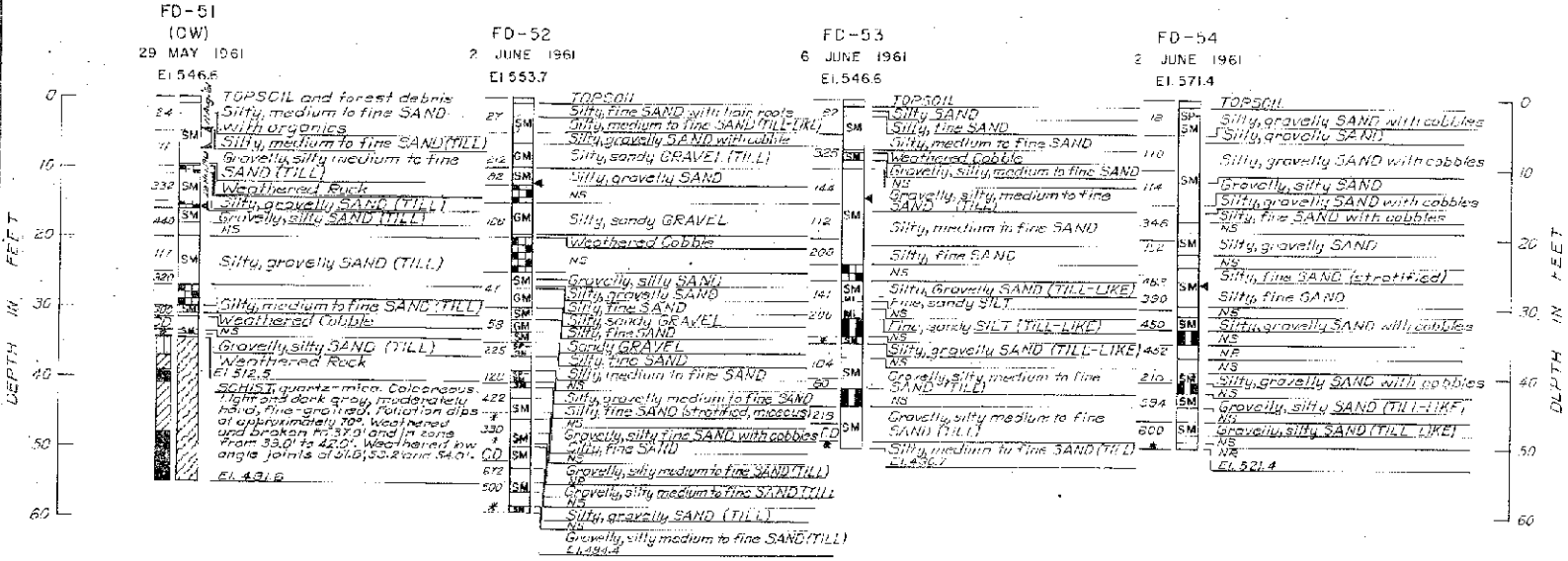
SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-2-1500
SHEET 16

CORPS OF ENGINEERS

U. S. ARMY







NOTES

Elevations refer to Mean Sea Level Datum.
For Location of Foundation Explorations, see Sheet No. 3
For Legend of Graphic Logs and applicable notes, see Sheet No. 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.A.V.	R.D.B.	H.A.V.

SUBMITTED
HEAD, GEOLOGY SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, FDN. & MATLS. BRANCH
APPROVAL RECOMMENDED
CHIEF, ENGINEERING DIVISION
APPROVED
DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
RECORD OF FOUNDATION EXPLORATIONS NO. 4
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

SCALE AS SHOWN SPEC. NO. CIV. ENG. 9-519-62-49
DRAWING NUMBER
CT-2-1501
SHEET 17

CORPS OF ENGINEERS

U. S. ARMY

FD-55

13 JUNE 1961

El. 456.2

TOPSOIL and forest debris with organics and trace of gravel

Gravelly, silty SAND

Silty, gravelly SAND with decomposed cobbles

Gravelly, silty SAND

Silty, gravelly SAND with decomposed gravel and cobbles

NR

Silty, sandy GRAVEL with decomposed gravel and cobbles

Silty, gravelly medium to fine SAND (TILL)

NS

Gravelly, silty, medium to fine SAND (TILL)

Silty, sandy GRAVEL (TILL)

Silty, medium to fine SAND

NS

Gravelly, silty medium to fine SAND (TILL)

El. 356.2

SCHIST, quartz-mica. Colcareous. Light and dark gray, moderately soft to hard, fine-grained. Foliation dips at approximately 70°. Weathered and broken throughout along foliation and closer jointing. Mud-filled fracture zone at 66.2'.

El. 276.2

FD-56

9 JUNE 1961

El. 561.2

TOPSOIL and forest debris with roots

Gravelly, silty medium to fine SAND with roots

Fine, sandy SILT with roots

Silty medium to fine SAND

Silty, gravelly SAND

Silty, gravelly SAND

NS

Silty, gravelly SAND

Gravelly, silty medium to fine SAND

Silty, gravelly SAND

Gravelly, silty fine SAND

Gravelly, silty medium to fine SAND

Silty, fine SAND

NS

Silty, fine SAND

Silty medium to fine SAND

Silty, fine SAND

Gravelly, silty fine SAND

Silty, fine SAND

NS

Gravelly, silty, fine SAND

NS

Silty, gravelly SAND

Silty, fine SAND

NS

Silty, fine sandy GRAVEL

NS

Silty, sandy GRAVEL with cobbles

Silty, SAND

Silty, sandy GRAVEL

NS

Silty, gravelly SAND

FD-57

12 JUNE 1961

El. 569.0

TOPSOIL

Silty, gravelly medium to fine SAND with cobbles

Silty, gravelly SAND

NS

Gravelly, silty, medium to fine SAND (TILL-LIKE)

Silty, fine SAND

Silty, fine SAND

NS

Gravelly, silty medium to fine SAND (TILL-LIKE)

NS

Silty, fine gravelly SAND

NS

Silty, medium to fine SAND (TILL-LIKE)

FD-58

16 OCT 1961

El. 442.5

TOPSOIL

Silty, fine SAND with organics

Silty, fine SAND

Silty, sandy GRAVEL

Rock fragments

El. 436.7

SCHIST, quartz sericite with biotite and garnet. Light and dark gray, moderately hard, fresh, coarse-grained. Foliation dips at approximately 70° slightly weathered on a few foliation planes

El. 415.0

FD-59

25 OCT 1961

El. 368.2

Silty fine SAND with few roots

Silty, fine SAND

Gravelly, silty SAND

Silty, sandy GRAVEL with cobbles

Silty, sandy GRAVEL (TILL)

Silty, sandy GRAVEL (TILL)

Silty, gravelly SAND (TILL)

Silty, gravelly SAND (TILL)

Silty, sandy GRAVEL (TILL)

Gravelly, silty SAND (TILL)

Silty, gravelly SAND (TILL)

Silty, sandy GRAVEL (TILL)

NS 11.3' to 18.8'

SCHIST, quartz-mica. Light gray, moderately hard, fine-grained. Calcareous. Slight weathering along close joints and open foliations to approximately 54.0'

El. 368.4

FD-60

18 OCT 1961

El. 445.2

TOPSOIL

Fine, sandy SILT with cobbles and organics

Silty, sandy GRAVEL with cobbles

Silty, sandy GRAVEL

El. 433.1

SCHIST, quartz-mica. Dark gray, moderately hard, coarse-grained. Badly weathered in zones at approximately 14.6' to 14.9', 17.0' to 21.0' and 24.4' to 25.4'. Mud filled seam of 17.4'. Thin bed of fine-grained hornblende schist from approximately 13.4' to 14.9'. Foliation dips at approximately 70°.

El. 413.0

FD-61

23 OCT 1961

El. 454.9

TOPSOIL

Fine, sandy SILT with roots

Silty, gravelly SAND

Silty, medium to fine SAND

Silty, sandy GRAVEL

Silty, gravelly SAND, evidence of weathered rock

El. 437.7

SCHIST, quartz-mica. Dark gray, moderately hard, fresh, coarse-grained. Fine grained hornblende schist from 24.0' to 26.5'. Foliation dips of approximately 70°. Slightly weathered on open foliation at approximately 24.0°

El. 415.8

DEPTH IN FEET

FD-62

30 OCT 1961

El. 444.0

TOPSOIL

Silty, gravelly, medium to fine SAND

Fine, sandy SILT with organics

Silty, sandy GRAVEL

Silty, fine SAND

Weathered Rock

El. 427.2

SCHIST, quartz-sericite with disseminated biotite and garnet. Light and dark gray, moderately hard, coarse-grained. Thin fine grained beds from 28.6' to 31.3'. Foliation dips at approximately 70°. Badly weathered zones from approximately 20.6' to 22.3' and 24.0' to 28.6'.

El. 405.7

FD-63

13 NOV 1961

El. 456.7

Gravelly, silty SAND with tree roots, twigs and occasional cobble

Silty sandy GRAVEL

Gravelly, silty medium to fine SAND

Gravelly, silty, medium to fine SAND with trace of organics

Gravelly, silty, medium to fine SAND with occasional cobble (TILL)

Silty, gravelly SAND with cobbles and weathered cobbles (TILL)

Silty, sandy GRAVEL (TILL)

Silty, sandy GRAVEL with cobbles (TILL)

NS

Silty, medium to fine SAND with weathered cobbles (TILL)

Silty, sandy GRAVEL (TILL)

Gravelly, silty SAND with cobbles and weathered cobbles (TILL)

Gravelly, silty, medium to fine SAND (TILL)

Silty, medium to fine SAND (TILL)

Silty, sandy GRAVEL with weathered cobbles (TILL)

Silty, sandy GRAVEL with cobbles and weathered cobbles (TILL)

Silty, medium to fine SAND with trace of gravel (TILL)

Silty, medium to fine SAND with trace of gravel (TILL)

El. 375.7

SCHIST, quartz-sericite with biotite. Light and dark gray, moderately hard, fine grained. Foliation dips at approximately 70°. Weathered on numerous foliation planes and joints to 64.5' with slight weathering on occasional foliations to bottom of hole. Calcareous from El. 375.7 70.0' to 72.3'.

FD-64

21 NOV 1961

El. 501.0

TOPSOIL

Silty, sandy GRAVEL with cobbles

Medium to fine SAND

Silty, gravelly SAND with cobbles

Silty, sandy GRAVEL with cobbles (TILL)

Silty, sandy GRAVEL with cobbles (TILL)

Silty, gravelly SAND with cobbles (TILL)

Gravelly, silty, medium to fine SAND with occasional cobbles (TILL)

Gravelly, silty, medium to fine SAND with occasional rubbles (TILL)

FD-65

6 DEC 1961

El. 438.7

TOPSOIL

Gravelly SAND with organics

Medium to fine SAND with trace of gravel

Gravelly SAND

Sandy GRAVEL with trace of silt

Silty, sandy GRAVEL with cobbles (TILL)

Silty, gravelly SAND (TILL)

Silty, sandy GRAVEL (TILL)

Silty, gravelly SAND (TILL)

Silty, sandy GRAVEL (TILL)

Silty, sandy GRAVEL with cobbles (TILL)

Silty, gravelly SAND with cobbles (TILL)

Silty, sandy GRAVEL with cobbles (TILL)

Silty, sandy GRAVEL with rock fragments (TILL)

Silty, gravelly SAND with occasional cobbles

Gravelly, silty SAND with occasional cobbles

El. 385.4 Weathered Rock

SCHIST, quartz-sericite with biotite. Light gray, moderately hard, fine-grained. Foliation dips at approximately 60°. Slightly weathered on occasional foliation planes. Scattered Calcareous

El. 357.5

DEPTH IN FEET

NOTES

Elevations refer to Mean Sea Level Datum

For Location of Foundation Explorations, see Sheet No. 8

For Legend of Graphic Logs and applicable notes, see Sheet No. 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY: H.A.V. | DR. BY: H.D.B. | CK. BY: H.A.V.

SUBMITTED: H.O. Charley, HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED: CHIEF, FOUNDATION & MATLS. BRANCH

APPROVAL RECOMMENDED: CHIEF, PLANS & REPTS. BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF FOUNDATION EXPLORATIONS NO. 5

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED: CHIEF, ENGINEERING DIV. SECT.

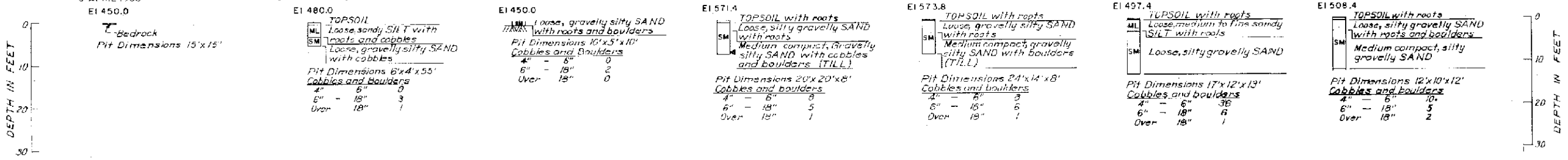
DATE MARCH 1962

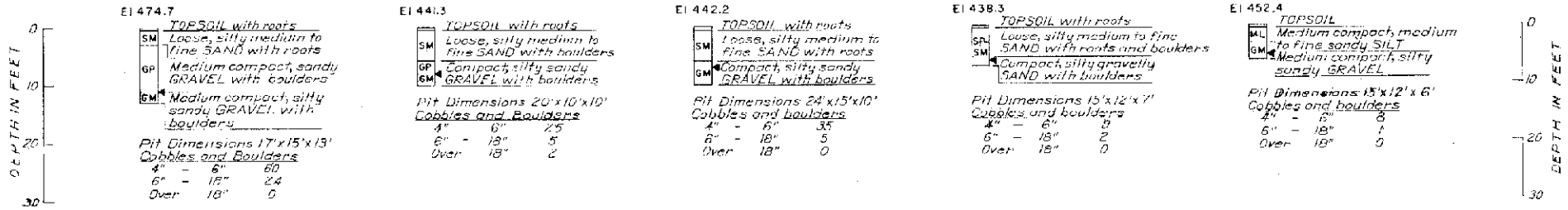
SCALE AS SHOWN | SPEC. NO. (1) 1 SHT. NO. REF. 49

DRAWING NUMBER

CT-2-1502

SHEET 10





NOTES

Elevations refer to Mean Sea Level Datum
For Location of Foundation Explorations, see Sheet No. 8
For Legend of Graphic Logs and applicable notes see Sheet No 14

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY
H.A.V.	R.D.B.	H.A.V.

SUBMITTED
Head, Geology Section

RECOMMENDED
Chief, Materials Branch

APPROVED RECOMMENDED
Chief, Plans & Reports Branch

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF FOUNDATION EXPLORATIONS NO. 6

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
Chief Engineering Division

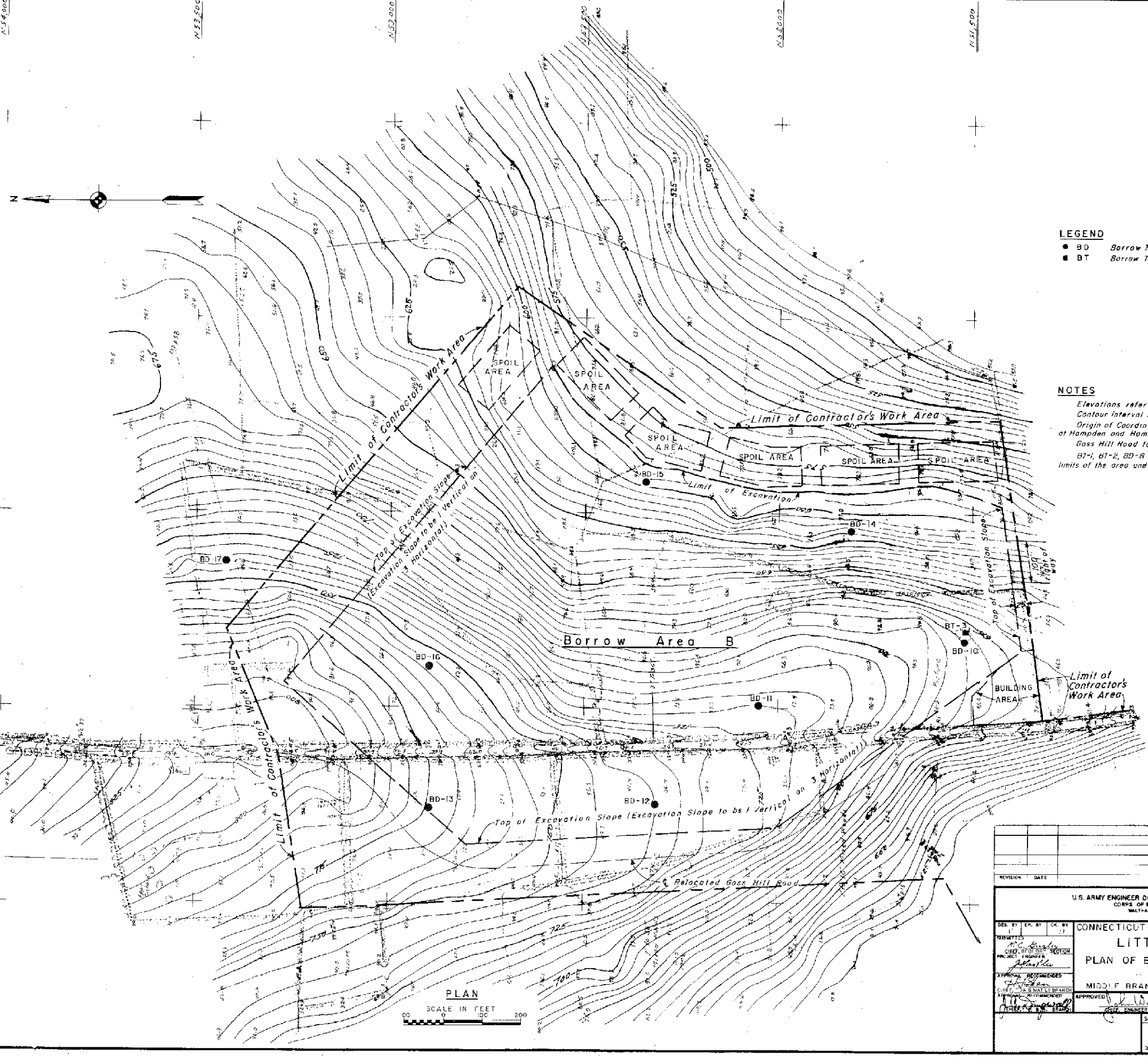
DATE MARCH 1962

SCALE AS SHOWN SPECIFICATION NO. 15 135 SP 19

DRAWING NUMBER
CT-2-1503

SHEET 15

CORPS OF ENGINEERS — U.S. ARMY



LEGEND

- ● BD — Borrow Test Boring
- ■ BT — Borrow Test Pit

NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval is 5 feet.
Origin of Coordinates is a local grid. County Bound at Hampden and Hampshire is N 50,000 – E 50,000.
Goss Hill Road to be relocated.
BT-1, BT-2, BD-8 and BD-9 are located beyond the limits of the area and topography.

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY	DR. BY	CK. BY

SUBMITTED
CHIEF, SPEC. & EST. SECTION
PROJECT ENGINEER
APPROVAL RECOMMENDED
CHIEF, SOILS & MATLS. BRANCH
APPROVAL RECOMMENDED
CHIEF, E & D BR. BRANCH

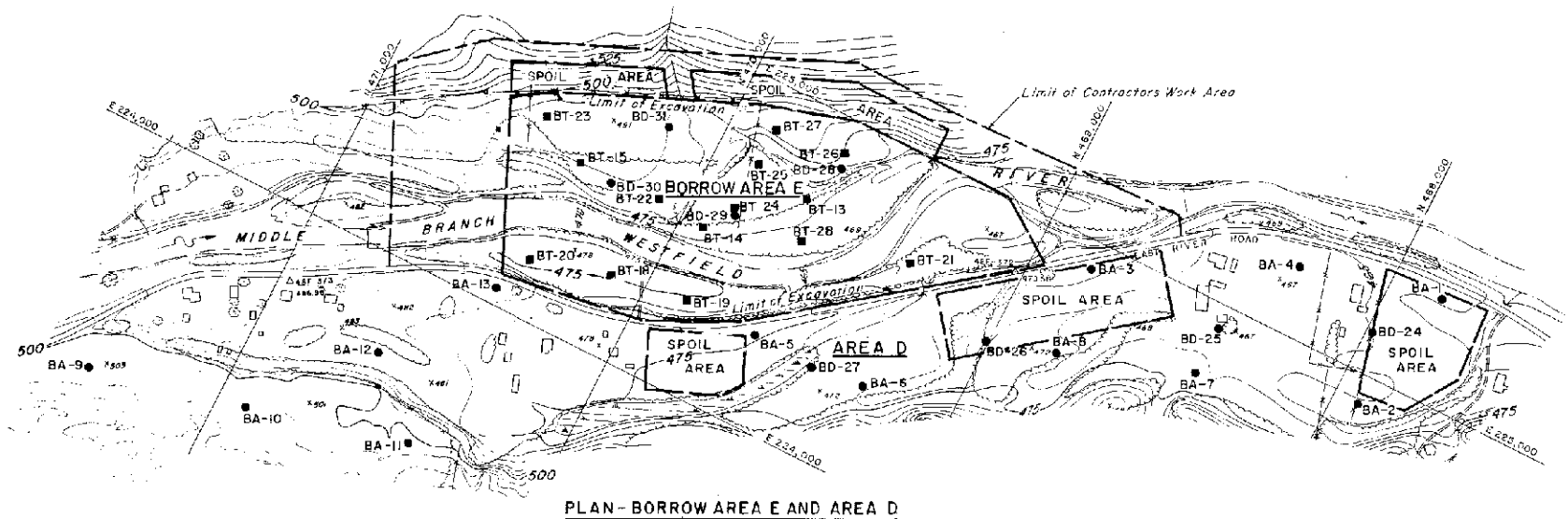
CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
PLAN OF BORROW EXPLORATIONS AREA B
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENGINEERING DIVISION
DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV ENG. 19-016-[illegible]
DRAWING NUMBER
CT-2-1504
SHEET 20

CORPS OF ENGINEERS

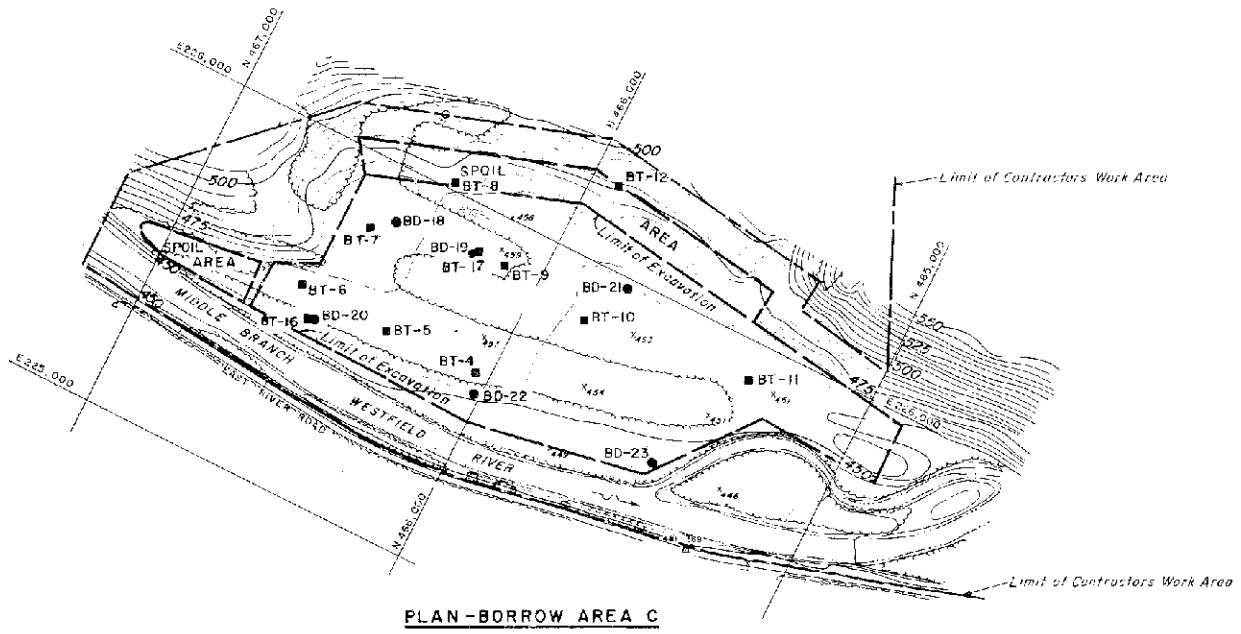
U. S. ARMY



PLAN - BORROW AREA E AND AREA D

SCALE IN FEET

200 0 200 400



PLAN - BORROW AREA C

SCALE IN FEET

200 0 200 400

LEGEND

- ● BD *Borrow Test Boring*
- ● BA *Borrow Hand Auger Boring*
- ■ BT *Borrow Test Pit*

NOTES

Elevations refer to Mean Sea Level Datum.
Contour interval is 5 feet.
1000 foot Grid based on Massachusetts Plane Coordinate System.
Area D extends west of East River Road to El. 500. Contractor may obtain temporary construction fill material from this area except within 100 feet of occupied buildings

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY J.H. | DR. BY R.G.B. | CK. BY J.H.

SUBMITTED: R.C. Hartley, HEAD, GEOLOGY SECTION
PROJECT ENGINEER: Charles
APPROVED/RECOMMENDED: [illegible], CHIEF, FOUNDATIONS BRANCH
APPROVED/RECOMMENDED: [illegible], CHIEF, PLANS, UNITS BRANCH
APPROVED: [illegible], CHIEF, ENGINEERING DIVISION
DATE: MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

PLANS OF BORROW EXPLORATIONS AREAS C, D AND E

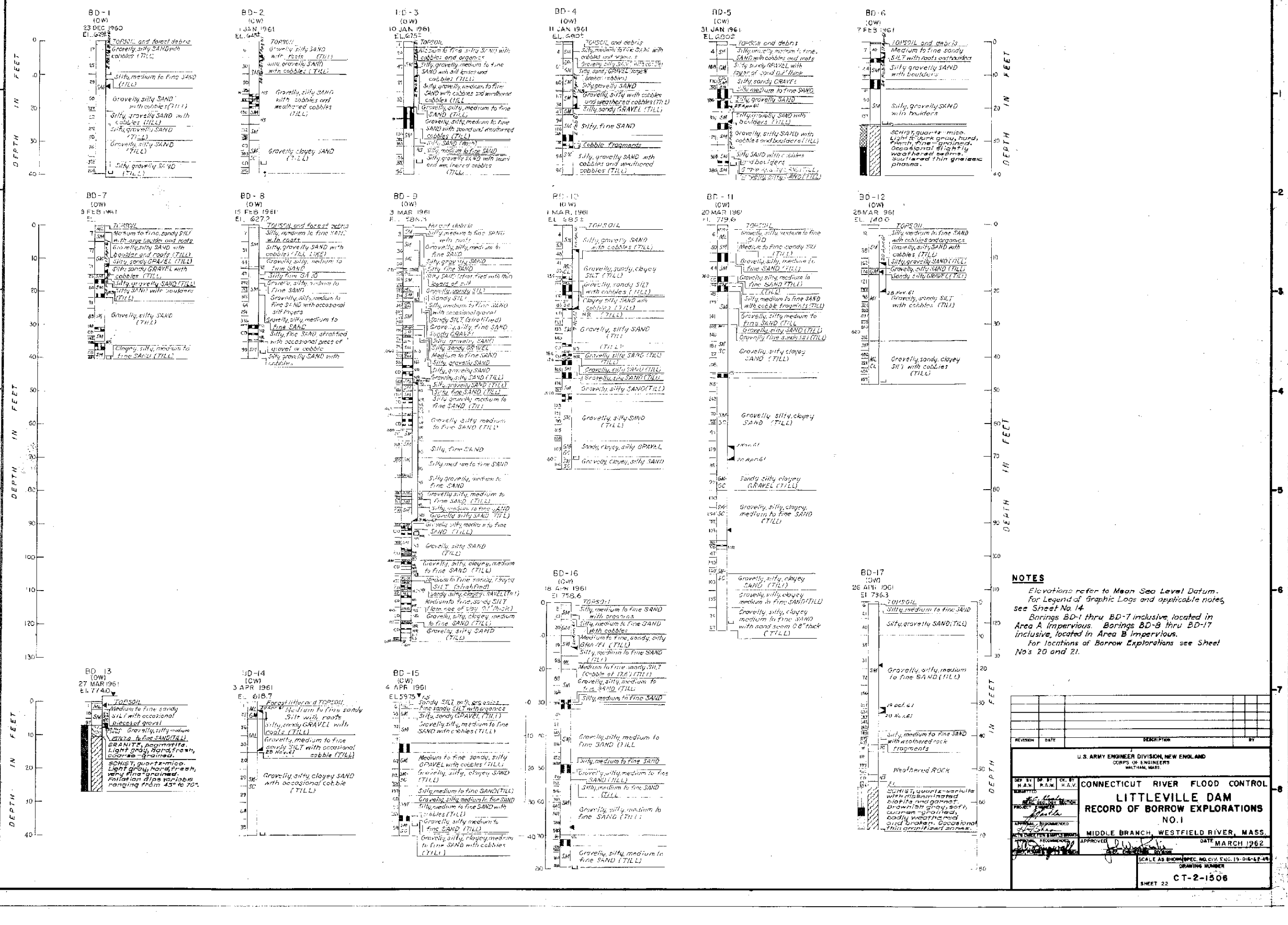
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

SCALE AS SHOWN | SPEC. NO. [illegible]

DRAWING NUMBER
CT-2-1505

SHEET 21

CORPS OF ENGINEERS — U. S. ARMY



NOTES

Elevations refer to Mean Sea Level Datum. For Legend of Graphic Logs and applicable notes, see Sheet No. 14.

Borings BD-1 thru BD-7 inclusive, located in Area A Impervious. Borings BD-8 thru BD-17 inclusive, located in Area B Impervious.

For locations of Borrow Explorations see Sheet No's 20 and 21.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. | DR. BY R.A.W. | CK. BY H.A.V.

SUBMITTED: Chief, Engineering Section
PROJECT ENGR.: Engineer
APPROVAL RECOMMENDED: Acting Chief, Foundation & Materials Branch
APPROVED: Chief, Engineering Division
DATE: MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
RECORD OF BORROW EXPLORATIONS
NO. I
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

SCALE AS SHOWN | SPEC. NO. CIV. ENG. 19-016-62-49
DRAWING NUMBER
CT-2-1506
SHEET 22

CORPS OF ENGINEERS

U. S. ARMY

BD-18
14 AUG 1961
El 463.4
- ML — Fine, sandy SILT with organics
- SM — Silty, fine SAND with trace of organics
- GP — Sandy GRAVEL
- SM — Silty, gravelly SAND
- Silty, gravelly, medium to fine SAND
- ML — Fine, sandy SILT
- SP-SM — Silty, gravelly, medium to fine SAND with occasional cobbles

BD-19
16 AUG 1961
El 481.3
- TOPSOIL with gravel and organics
- SM — Silty, sandy GRAVEL with cobbles
- SM — Silty, gravelly SAND with cobbles

BD-20
17 AUG 1961
El 460.8
- SM — TOPSOIL and forest debris, gravelly, silty fine SAND with gravel and organics
- GM — Silty, sandy GRAVEL with cobbles
- SM — Silty, gravelly SAND with cobbles

BD-21
22 AUG 1961
El 458.9
- PT — Fine, sandy organic SILT with roots and forest debris
- SM — Silty, medium to fine SAND
- Silty, sandy GRAVEL with cobbles
- Silty, sandy GRAVEL with cobbles (TILL)

BD-22
24 AUG 1961
El 460.3
- SM — TOPSOIL with organics
- Silty, fine SAND with roots
- GP-GM — Silty, sandy GRAVEL with boulders
- GP — Sandy GRAVEL
- SM — Silty, sandy GRAVEL
- SM — Silty, medium to fine SAND
- GP-GM — Silty, sandy GRAVEL with cobbles
- Silty, sandy GRAVEL with cobbles and decomposed gravel

BD-23
28 AUG 1961
El 447.8
- GM — Silty, medium to fine SAND
- GP-GM — Silty, sandy GRAVEL with cobbles

BD-24
29 SEPT 1961
El 466.6
- SM — TOPSOIL with organics
- Silty fine SAND
- GM — Sandy GRAVEL with cobbles trace of silt
- SM — Silty, gravelly SAND with cobbles
- GM — Silty, sandy GRAVEL
- Silty, sandy GRAVEL with cobbles (TILL)
- Silty, gravelly SAND (TILL)
- Silty, fine SAND with rock fragments

BD-25
2 OCT 1961
El 470.2
- TOPSOIL
- SM — Silty, fine SAND
- GM — Silty, sandy GRAVEL with cobbles
- Silty, gravelly SAND (TILL) weathered ROCK fragments with silty sand

BD-26
2 OCT 1961
El 476.6
- TOPSOIL with organics
- Silty, fine SAND
- GM — Silty, sandy GRAVEL with weathered cobbles (TILL)
- Silty, sandy GRAVEL (TILL) with flat stratified silt and clay
- Silty, fine SAND (micaceous)

BD-27
4 OCT 1961
El 476.4
- SM — Silty, medium to fine SAND with organics
- Silty, gravelly SAND with cobbles
- Silty gravelly SAND with weathered boulders (TILL LIKE)
- Silty sandy GRAVEL
- SM — Silty fine SAND with occasional l" strata of silt

BD-28
3 OCT 1961
El 472.4
- ML — Fine, sandy SILT with organics
- GP-GM — Silty, sandy GRAVEL with cobbles
- Silty, sandy GRAVEL with cobbles

BD-29
10 OCT 1961
El 477.5
- SM — Silty, medium to fine SAND with gross roots
- GP — Silty, sandy GRAVEL with cobbles and boulders
- SM — Silty, gravelly SAND with decomposed cobbles (TILL)

BD-30
11 OCT 1961
El 489.1
- TOPSOIL with roots
- SM — Silty fine SAND with roots
- Silty, gravelly SAND
- Silty sandy GRAVEL
- Weathered ROCK
- ROCK fragments

BD-31
12 OCT 1961
El. 489.9
- TOPSOIL with roots
- ML — Fine sandy SILT
- ML — Silty, medium to fine SAND
- Fine, sandy SILT
- GM — Silty, sandy GRAVEL with weathered cobbles and cobbles
- Fine, sandy SILT
- GM — Silty, sandy GRAVEL (TILL) with weathered rock fragments

BA-1
19 APR 1961
El 461.6
- SM — TOPSOIL and sod
- SP — Loose, silty fine SAND with hair roots
- SM — Loose, silty fine SAND
- Loose, gravelly SAND
- Loose, medium to fine SAND trace of silt
- Loose, silty, medium to fine SAND
- Loose, silty gravelly SAND

BA-2
19 APR 1961
El 465.9
- SM — TOPSOIL and sod
- SP-SM — Loose, silty, fine SAND with hair roots
- SM — Silty, medium to fine SAND with trace of silt
- Gravelly SAND with trace of silt

BA-3
20 APR 1961
El 469.5
- SM — TOPSOIL and sod
- Loose, silty, fine SAND
- Loose, silty, gravelly medium to fine SAND
- Loose, gravelly, silty medium to fine SAND

BA-4
26 APR 1961
El 472.0
- SM — TOPSOIL and sod
- Loose, silty, fine SAND
- Loose, silty medium to fine SAND, trace of gravel

BA-5
26 APR 1961
El 477.7
- GP — TOPSOIL and sod
- GP — Loose, sandy GRAVEL
- Loose, gravelly SAND

BA-6
26 APR 1961
El 473.3
- SM — TOPSOIL and sod
- Loose, silty medium to fine SAND
- Silty, sandy GRAVEL

BA-7
28 APR 1961
El. 473.7
- TOPSOIL
- GM — Medium compact, silty, sandy GRAVEL with cobbles

BA-8
28 APR 1961
El 473.1
- TOPSOIL
- SM — Loose, silty fine SAND
- WS — Layer of cobbles

BA-9
28 APR 1961
El 503.1
- TOPSOIL
- ML — Loose, fine sandy SILT
- GM — Medium compact, silty gravelly SAND

BA-10
28 APR 1961
El 505.1
- TOPSOIL and sod
- SM — Loose, silty fine SAND
- ML — Compact silt
- SM — Loose, silty, fine SAND

BA-11
1 MAY 1961
El 502.4
- TOPSOIL and sod
- Loose, silty, sandy GRAVEL with cobbles

BA-12
1 MAY 1961
El 488.7
- SM — TOPSOIL and sod
- Loose, medium to fine SAND
- Loose, gravelly medium to fine SAND with cobbles

BA-13
1 MAY 1961
El 481.8
- GP — TOPSOIL with cobbles
- Loose gravelly SAND with cobbles

BT-1
3 MAR 1961
El 560± - 620±
- VS
- GP-GM — Silty, gravelly SAND

Pit Dimensions 2'x 2'x 1'

BT-2
17 APR 1961
El 520±
- GP-GM — Silty, sandy GRAVEL

Pit Dimensions 2'x 2'x 1'

BT-3
18 APR 1961
El 680±
- ML — TOPSOIL and sod
- Loose, fine, sandy SILT with hair roots
- SM — Compact, gravelly silty medium to fine SAND (TILL)
- Compact, gravelly silty SAND (TILL)

Pit Dimensions 15'x 15'x 15'

Cobbles and Boulders
- 4" - 6" 67
- 6" - 18" 29
- Over 18" 1

BT-4
19 APR 1961
El 456.2
- ML — TOPSOIL and sod
- Loose, fine, sandy SILT with hair roots
- GP — Compact, sandy GRAVEL
- SP — Compact, gravelly SAND

Approx. Pit Dimensions 10'x12'x12.3'

Cobbles and Boulders
- 4" - 6" 54
- 6" - 12" 18
- Over 12" 3

BT-5
19 APR 1961
El. 459.6
- SM, ML — TOPSOIL
- Loose, silty, fine SAND
- GP-GM — Compact, silty, sandy GRAVEL
- Compact, medium to fine SAND (stratified)
- SP — Compact, gravelly SAND

Approx. Pit Dimensions 10'x12'x12'

Cobbles and Boulders
- 4" - 6" 53
- 6" - 12" 16
- Over 12" 3

BT-6
19 APR 1961
El. 462.1
- SM — TOPSOIL and sod
- Compact, silty, fine SAND
- GP — Compact, sandy GRAVEL

Approx. Pit Dimensions 10'x12'x11.6'

Cobbles and Boulders
- 4" - 6" 69
- 6" - 18" 35
- Over 18" 2

DEPTH IN FEET

NOTES

Elevations refer to Mean Sea Level Da.

For Location of Borrow Explorations, see Sheet No's 20 and 21

For Legend of Graphic Logs and applicable notes see Sheet No. 18.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. DR. BY H.D.B. CK. BY H.A.V.

SUBMITTED
R.C. Stanley
HEAD, GEOLOGY SECTION

PROJECT ENGINEER

APPROVAL RECOMMENDED
CHIEF, FOR & HYD'L'S BRANCH

APPROVAL RECOMMENDED
CHIEF, PLANNING BRANCH

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

RECORD OF BORROW EXPLORATIONS NO.2

MIDDLE BRANCH, WESTFIELD RIVER, MASS.

APPROVED
CHIEF, ENG'NEERING DIVISION

DATE MARCH 1962

SCALE AS SHOWN SPEC. NO. CIV. ENG. 19-016-62-49

DRAWING NUMBER
CT-2-1507

SHEET 23

CORPS OF ENGINEERS

U. S. ARMY

DEPTH IN FEET

BT-7
APR. 20 1961
El. 484.0

TOPSOIL and sod
SM Loose, silty, fine SAND
GP Compact, gravelly SAND
SM-SW Loose, fine, sandy SILT
Silty, gravelly SAND

Approx. Pit Dimensions 10'x12'x 10.5'

Cobbles and Boulders
4"-6" 23
6"-18" 5
Over 18" 2

BT-8
APR. 20 1961
El. 468.3

TOPSOIL and forest debris
ML Compact, sandy SILT
SM Compact, silty, gravelly SAND

Approx. Pit Dimensions 10'x 12'x 9.6'

Cobbles and Boulders
4"-6" 25
6"-18" 16
Over 18" 3

BT-9
APR. 20 1961
El. 460.3

TOPSOIL and sod
SM Loose, silty, fine SAND
GW Compact, sandy GRAVEL
SM Compact, medium to fine SAND (stratified)
GP Compact, sandy GRAVEL with trace of silt

Approx. Pit Dimensions 10'x12'x 11.2'

Cobbles and Boulders
4"-6" 47
6"-18" 10
Over 18" 1

BT-10
APR. 20 1961
El. 456.2

TOPSOIL and forest debris
ML Loose, fine, sandy SILT with hair roots
SM Loose, silty fine SAND
GM Compact, silty, sandy GRAVEL

Approx. Pit Dimensions 10'x12'x 10'

Cobbles and Boulders
4"-6" 12
6"-18" 2
Over 18" 1

BT-11
APR. 20 1961
El. 453.8

Sandy SILT and swamp debris
ML Loose, fine, sandy SILT
GP Compact, sandy GRAVEL with trace of silt

Approx. Pit Dimensions 10'x12'x 9.6'

BT-12
APR. 20 1961
El. 481.4

TOPSOIL and forest debris
SM Loose, gravelly, silty SAND with roots
SP Compact gravelly SAND
SM Loose, gravelly, silty medium to fine SAND

Approx. Pit Dimensions 10'x12'x 11.5'

BT-13
APR. 25 1961
El. 475.9

TOPSOIL and sod
GP Compact, sandy GRAVEL

Approx. Pit Dimensions 10'x12'x 9.6'

Cobbles and Boulders
4"-6" 36
6"-12" 15
Over 12" 1

BT-14
APR. 25 1961
El. 477.3

TOPSOIL and sod
SM Loose, silty, medium to fine SAND
GP Compact, sandy GRAVEL

Approx. Pit Dimensions 10'x12'x 10.6'

Cobbles and Boulders
4"-6" 23
6"-12" 10
Over 12" 1

BT-15
APR. 25 1961
El. 481.5

TOPSOIL and sod
SM Loose, fine, sandy SILT
GP Compact, sandy GRAVEL with trace of silt
GM Compact, silty sandy GRAVEL

Approx. Pit Dimensions 10'x 12'x 10.5'

Cobbles and Boulders
4"-6" 26
6"-12" 4
Over 12" 0

BT-16
NOV. 20 1961
El. 480.8

TOPSOIL
SM Loose, silty, medium to fine SAND with trace of silt and large gravel
GP Compact, sandy GRAVEL with roots and trace of silt
SW Compact SAND (stratified)
GP Compact, sandy GRAVEL

Approx. Pit Dimensions 10'x 12' x 13.2'

Cobbles and Boulders
4"-6" 43
6"-12" 18
Over 12" 3

BT-17
NOV. 20 1961
El. 481.3

TOPSOIL
SM Loose, silty, fine SAND
GP Compact, sandy GRAVEL
GM Compact, silty sandy GRAVEL with trace of silt

Approx. Pit Dimensions 10'x 12'x 14'

Cobbles and Boulders
4"-6" 37
6"-18" 20
Over 18" 1

BT-18
NOV. 20 1961
El. 477.6

TOPSOIL and roots
SM Loose, silty, fine SAND
NS
SM Loose, silty, fine SAND with roots
GP Compact, sandy GRAVEL trace of silt

Approx. Pit Dimensions 10'x 12'x 10.6'

Cobbles and Boulders
4"-6" 21
6" 12" 4
Over 12" 1

BT-19
NOV. 21 1961
El. 475.2

TOPSOIL
SM Loose, silty, fine SAND
GP Compact, sandy GRAVEL
SP Compact, silty gravelly SAND with trace of silt
SM

Approx. Pit Dimensions 10'x 12'x 11'

Cobbles and Boulders
4"-6" 29
6" 12" 9
Over 12" 1

BT-20
NOV. 21 1961
El. 480.2

TOPSOIL
SP-SM Compact, silty, gravelly, medium to fine SAND (stratified)
GP Compact sandy GRAVEL with trace of silt

Approx Pit Dimensions 10'x12'x 14'

Cobbles and Boulders
4"-8" 21
6"-12" 5
Over 12" 0

ST-7.1
NOV. 21 1961
El. 470.6

TOPSOIL and roots
GP Sandy GRAVEL with voids
SM Loose silty medium to fine SAND
GP Compact sandy GRAVEL Sandy GRAVEL with trace of silt

Approx. Pit Dimensions 10'x 12'x 11.7'

Cobbles and Boulders
4"-6" 37
6"-12" 16
Over 12" 10

BT-22
NOV. 21 1961
El. 482.5

TOPSOIL and roots
SM Loose, silty fine SAND
GP Compact, sandy GRAVEL
GM Compact, silty sandy GRAVEL

Approx. Pit Dimensions 10'x12'x 13.2'

Cobbles and Boulders
4"-6" 45
6"-12" 10
Over 12" 1

BT-23
NOV. 22 1961
El. 492.1

TOPSOIL and forest debris
SM Loose, sandy, fine SAND
GM Silty, sandy GRAVEL with trace of silt

Approx. Pit Dimensions 10'x 12'x 9.3'

Cobbles and Boulders
4"-6" 0
6" 18" 0
Over 18" 0

BT-24
NOV. 27 1961
El. 477.5

TOPSOIL and forest debris
SM Loose, silty, fine SAND with roots and trace of silt
GP Compact, sandy GRAVEL
Compact, sandy GRAVEL with trace of silt

Approx. Pit Dimensions 10'x 12'x 12.3'

Cobbles and Boulders
4"-6" 16
6"-12" 4
Over 12" 1

BT-25
NOV. 27 1961
El. 474.3

TOPSOIL and forest debris
GP-GM Compact, sandy GRAVEL
SM Loose, silty medium to fine SAND with trace of silt
NS
GP Compact, sandy GRAVEL Sandy GRAVEL with trace of silt

Approx. Pit Dimensions 10'x12'x 11.9.

Cobbles and Boulders
4"-6" 6
6"-18" 0
Over 18" 0

BT-26
NOV. 28 1961
El. 478.1

TOPSOIL and forest debris
SM Loose, silty, fine SAND with roots
GP Compact, sandy, GRAVEL
SP Compact, silty gravelly SAND (TILL-LIKE)
SM

Approx. Pit Dimensions 10'x12'x 11.8'

Cobbles and Boulders
4"-6" 28
6"-12" 19
Over 18" 4

BT-27
NOV. 27 1961
E.. 482.6

TOPSOIL and forest debris
GM Loose, silty, fine SAND with roots
GP-SM Compact, silty, sandy GRAVEL

Approx. Pit Dimensions 10'x12'x 9.8'

Cobbles and Boulders
4"-6" 15
6"-12" 2
Over 12" 1

BT-28
NOV. 29 1961
El. 472.9

TOPSOIL and forest debris
SM Loose, SAND with trace of gravel
SP Cobbles with sandy gravel
GP Compact gravelly SAND Compact, sandy GRAVEL

Approx. Pit Dimensions 10' x 12' x 10.8'

Cobbles and Boulders
4"-8" 28
6"-12" 8
Over 12" 4

NOTES

Elevations refer to Mean Sea Level Datum.
For Location of Borrow Explorations Sheets 20 and 21.
For Legend of Graphic Logs and applicable notes see sheet No. 14.

REVISION	DATE	DESCRIPTION	BY

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY H.A.V. | DR. BY R.D.B. | CK. BY H.A.V.

SUBMITTED: W. C. Hartley, HEAD, GEOLOGY SECTION
PROJECT ENGINEER: R. D. Butler
APPROVAL RECOMMENDED: H. A. Vokes, CHIEF, FDN & MAT'LS BRANCH
APPROVED RECOMMENDED: J. D. Ingraham, CHIEF, PLANS & REPTS. BRANCH
APPROVED: W. Hunt Jr., CHIEF, ENGINEERING DIVISION

CONNECTICUT RIVER FLOOD CONTROL
LITTLEVILLE DAM
RECORD OF BORROW EXPLORATIONS NO. 3
MIDDLE BRANCH, WESTFIELD RIVER, MASS.

DATE MARCH 1962

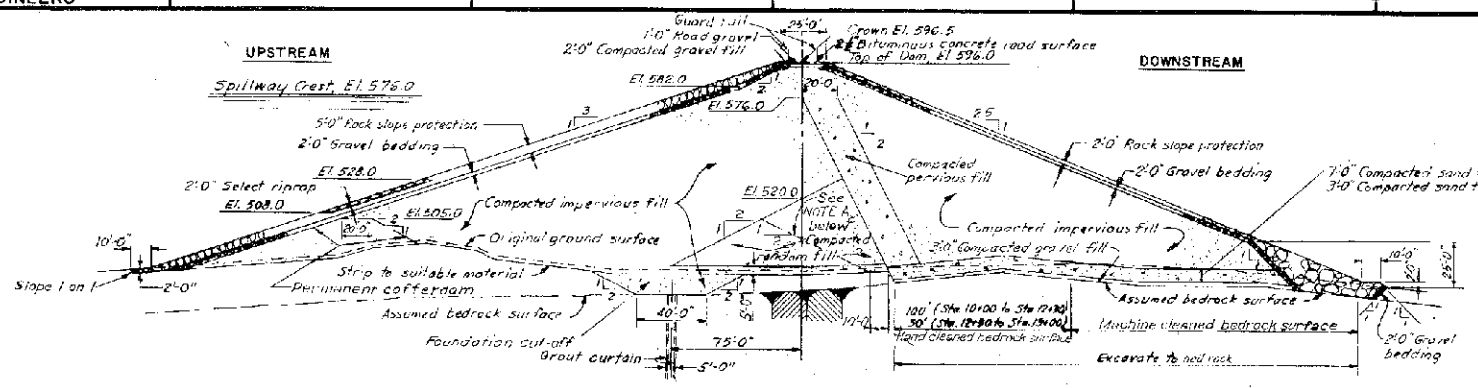
SCALE AS SHOWN | SPEC. NO. CIV ENG. (1)-016-62-49

DRAWING NUMBER
CT-2-1508

SHEET 24

CORPS OF ENGINEERS

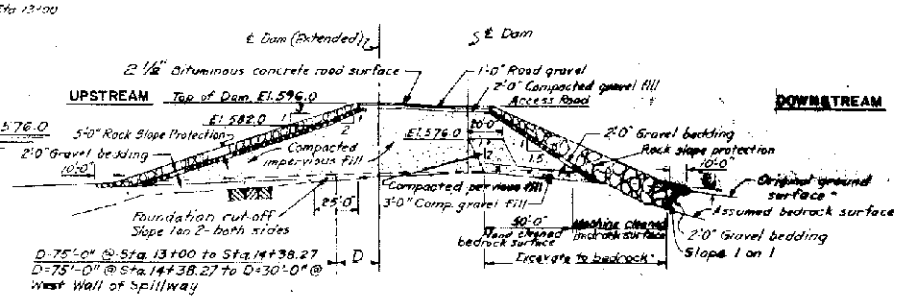
U. S. ARMY



SECTION AT STA. 11+65

(TYPICAL FROM STA. 10+00 TO STA. 13+00)

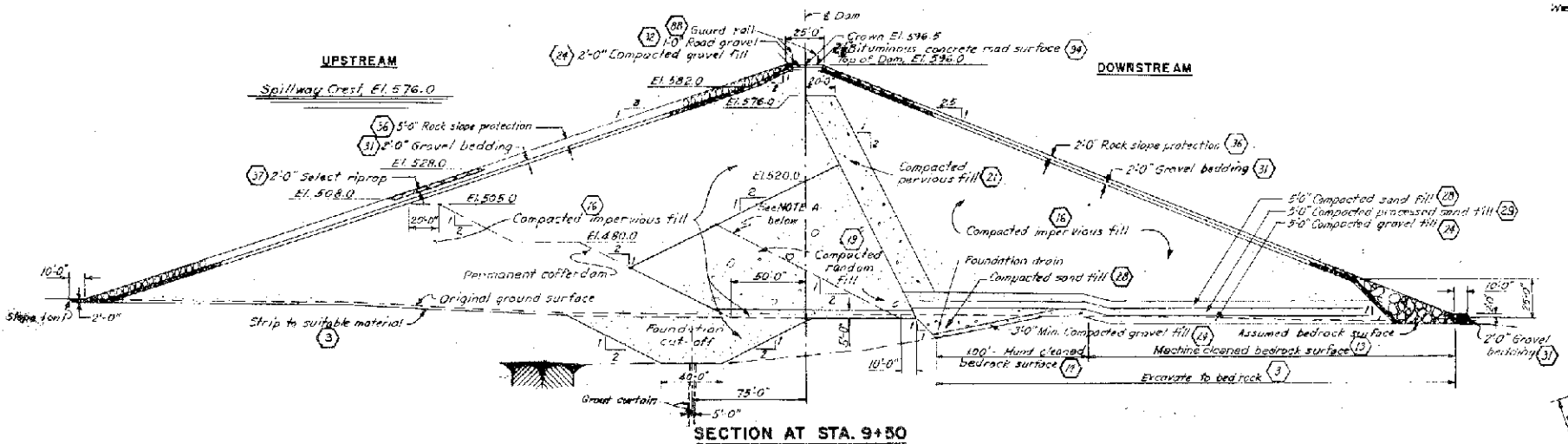
SCALE: 1" = 40'



SECTION AT STA. 14+00

(TYPICAL FROM STA. 13+00 TO STA. 14+84.27)

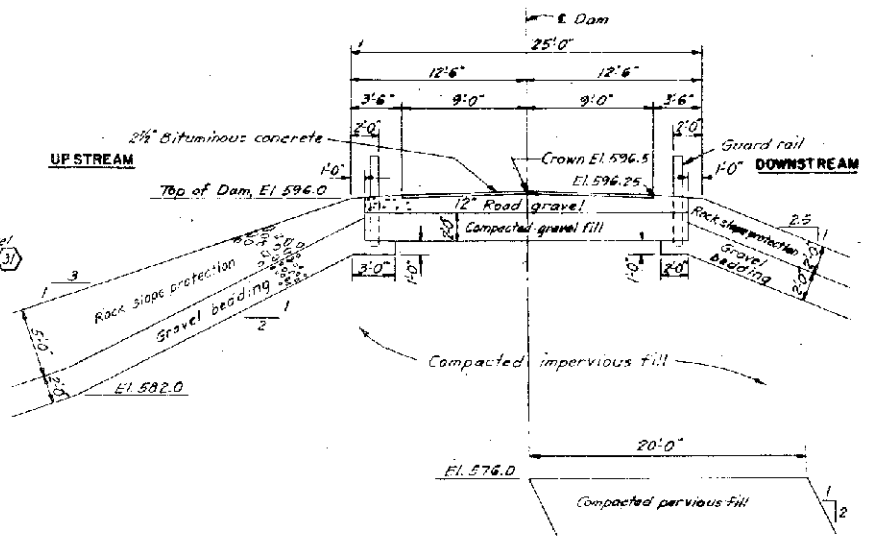
SCALE: 1" = 40'



SECTION AT STA. 9+50

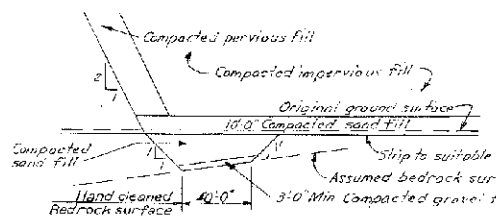
(TYPICAL FROM STA 9+25 TO STA 10+00)

SCALE: 1" = 40'



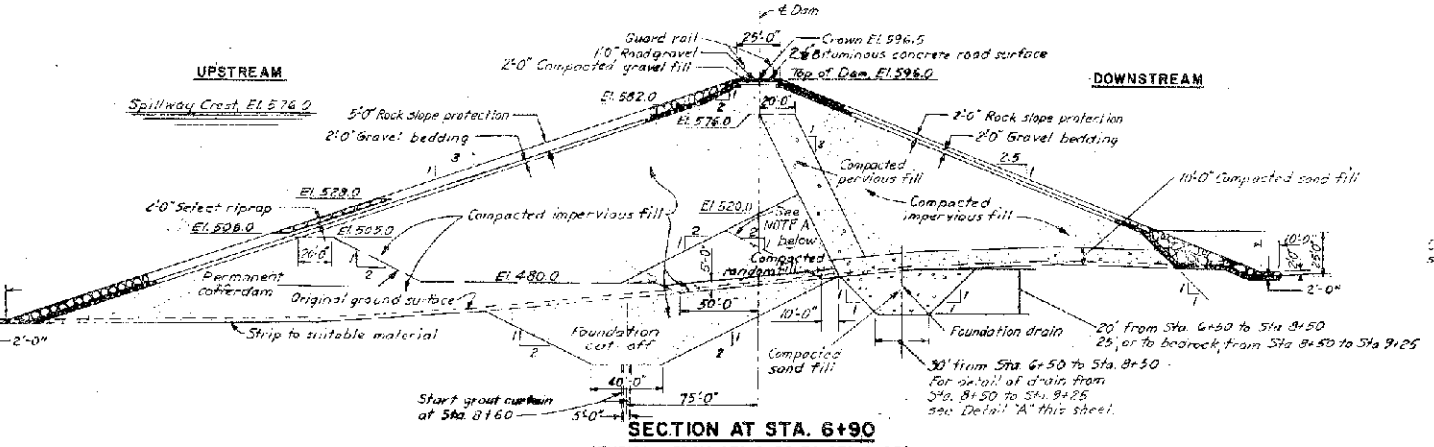
TOP OF DAM DETAIL

SCALE: 1" = 5'



DETAIL "A"

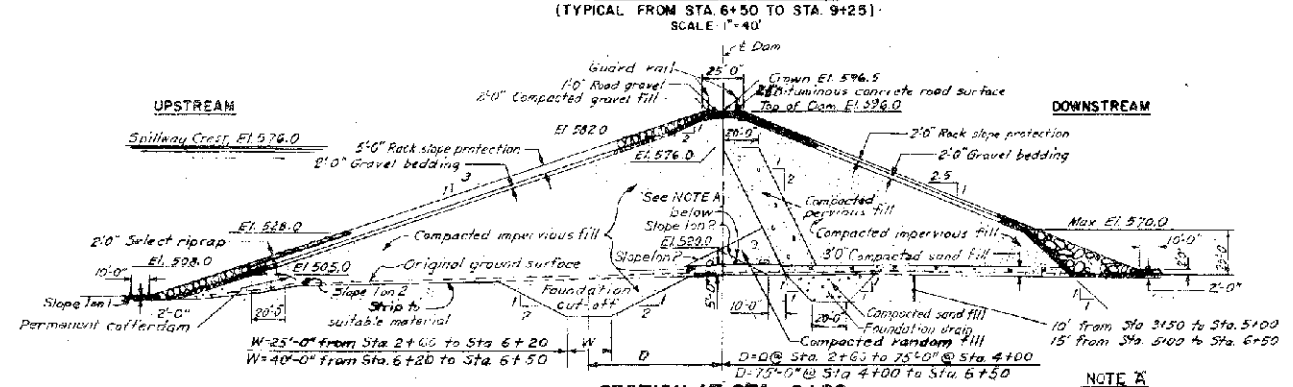
SCALE: 1" = 40'



SECTION AT STA. 6+90

(TYPICAL FROM STA. 6+50 TO STA. 9+25)

SCALE: 1" = 40'



SECTION AT STA. 6+00

(TYPICAL FROM STA. 3+00 TO STA. 6+50)

SCALE: 1" = 40'

NOTE A

Limit for placement of compacted random fill and compacted impervious fill prior to placement of adjoining fills

GRAPHIC SCALES

1" = 5' 5' 0 5' 10'

1" = 40' 40' 0 40' 80'

REVISION	DATE	DESCRIPTION

U.S. ARMY ENGINEER DIVISION, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

DES. BY RH | DR. BY K.H.W. | CH. BY J.M.

PROJECT ENGINEER

RECOMMENDED

APPROVED

DATE MARCH 1962

CONNECTICUT RIVER FLOOD CONTROL

LITTLEVILLE DAM

EMBANKMENT SECTIONS

MIDDLE BRANCH, WESTFIELD RIVER, MASSACHUSETTS

SCALE: AS SHOWN | SPEC NO. CIV ENG 19-016-62-49

DRAWING NUMBER

CT-1-5731

SHEET 25

Connecticut River Hydro-Electric 1955



1955 Reports

Proposed Construction of a Hydro-Electric installation on the Connecticut River in the vicinity of Windsor Locks, Ct - May 1955.

Bridges	Willimansett-Holyoke Bridge
City/Town	Holyoke
Water	Connecticut River

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING

TIGHE & BOND
CONSULTING ENGINEERS
GEORGE H. McDONNELL, PROP.
189 HIGH STREET
HOLYOKE, MASSACHUSETTS

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

May 11, 1955

The Honorable the Board of County Commissioners
Hampden County Court House
Springfield, Massachusetts

Gentlemen:

In accordance with your instructions I have been following developments resulting from the proposed construction of a hydro-electric installation on the Connecticut River in Connecticut in the vicinity of Windsor Locks and report to you as follows:

A number of years ago the Corps of Engineers of the United States conducted a study and survey on the possibility of making the Connecticut River navigable from Long Island Sound as far as Holyoke, Massachusetts. In connection with this study, it was brought out that a dam constructed at Windsor Locks, Connecticut could be used to raise the low water level of the Connecticut River upstream and thus obtain, to some extent, a channel approaching a depth more reasonable, from an economical viewpoint, for use in navigation. Certain dredging of the river bottom was also recommended as a necessary part of the work and this dredging and shaping of the river bottom to form a channel, combined with the increase in low water level of the river by the construction of the dam in Connecticut, would provide an adequate depth of water all the way upstream to Holyoke for navigation purposes.

With the increased height of the river level caused by the construction of the proposed dam to approximately elevation 45.0, added head or fall would be available at the dam and power could be developed at a new hydro-electric installation that would, according to the report, be profitable and feasible.

Following this study and report, private power interests requested permission of the Federal Power Commission to make their own study of the feasibility and economy of the hydro-electric installation on the Connecticut River at approximately the same location as recommended in the Corps of Engineer's Report. During the past five years, more or less, this study has been conducted and the report on the subject has been completed. It is my understanding that this latest report finds the proposed hydro-electric development a sound project from a financial and practical viewpoint and that, based upon the facts and data gathered in the recent study, a request or petition has been filed, or is being filed, with the Federal Power Commission for the construction of a new dam across the Connecticut River near Windsor Locks.

I have not seen a copy of the report, nor have I seen an official summary of the contents of the report, but it would appear from information generally available that the dam will be substantially the same as recommended by the Corps of Engineers insofar as river height and control of flood flows are concerned. I do not know at this time what the report contains, or what the Power Company plans to do, regarding navigation and providing for lock facilities to carry shipping through or around the dam.

The proposed low water level of the Connecticut River that will result between the dam and the City of Holyoke seems to be the factor in the project causing concern to all communities along the

Connecticut River between Windsor Locks and Holyoke. Some are concerned over river heights that will occur at flood time with the new dam built across the river. The heighth of the present dam at Windsor Locks is about elevation 39.6 while the height of the proposed dam will probably be elevation 45.0. Thus, the water level in the river will be raised about 5 feet in the vicinity of the dam and this rise in water level will extend upstream to Holyoke where the rise in water level will become less and less and finally be zero at a point upstream from the Willimansett-Holyoke Bridge.

The increase in water level will be a constant condition during periods of normal low river flow. At time of high river flow and flood flow, the elevation of the surface of the water with the proposed dam construction will, in all probability, be the same as now exists with any given river flow. The reason for this is that as the river flow increases, gates of large proportion at the new dam will be opened. This will have the same effect as lowering the crest of the new dam. As the flow of water in the river increases and the level of the water rises, these gates will be opened more and more until finally, with all gates fully opened, the river at the site of the dam would have at least the same flow capacity as now exists under present day conditions. With the passing of the flood flow and a decline in the river stage, the gates would be slowly closed and the upstream river level controlled until normal flow conditions return and the gates could again be completely closed to bring the river to a controlled elevation 45.

Thus, based on informatiom that I have to date, it would seem safe to say that the only problem presented to the communities of Massachusetts located on the banks of the Connecticut River from the Connecticut lime to Holyoke will be the problem

of an increased minimum or low water river level during all months of the year except at times of the spring and fall freshets or other periods of short duration high flows. This higher low water level could cause some sewers and drains to be permanently flooded and might affect, to some degree, the operation and maintenance costs of certain flood control works. There would also be the possibility of the loss of power by private companies amd industry due to the permanently increased level of the river at the tailrace locations of water wheels and turbines.

The communities from the dam locations in Connecticut to Holyoke, particularly those in Massachusetts that will be affected by the proposed dam have grouped together to form a united front to investigate the potential problems that will result in the raising of the low water river level and any flood problems and to take steps to protect themselves and to obtain compensation for any loss that they might incur both in the way of capital investment or operation and maintenance charges.

As of the present time I do not have sufficient factual data and information to make a definite recommendation as to a stand to be taken in the matter of the construction of the dam and raising of the river level. However, it would seem advisable to have the municipal units record themselves both individually and as a group not opposed to the development of a hydro-electric project, but, in favor of proper and just compensation for any damage to be caused by such a development either in the way of necessary reconstruction of utilities and services, to increased maintenance costs, loss of power due to a decrease in available head, increase cost for maintenance of operation of flood control works, etc.

I will keep following the developments on this matter of the proposed dam as they occur, will keep your Board informed and will try to obtain copies of reports and plans as they are made available by the Power Company sponsoring the project.

Respectfully submitted,

George H. McDonnell
County Hydraulic Engineer

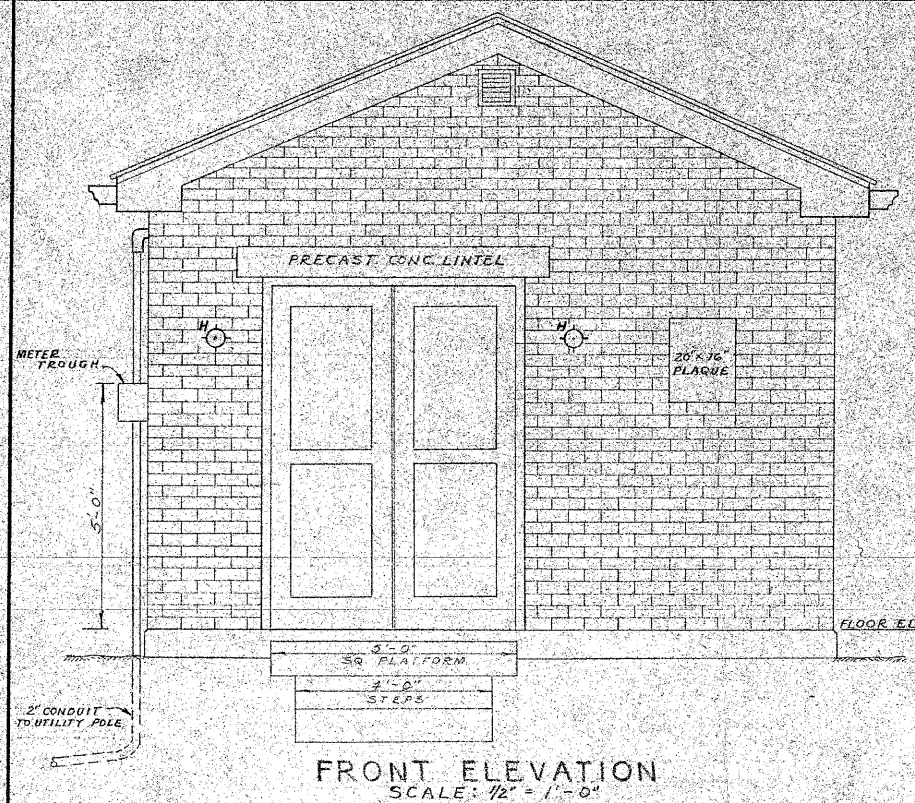
Connecticut River Intercepting Sewer - Agawam Pumping Station-1963



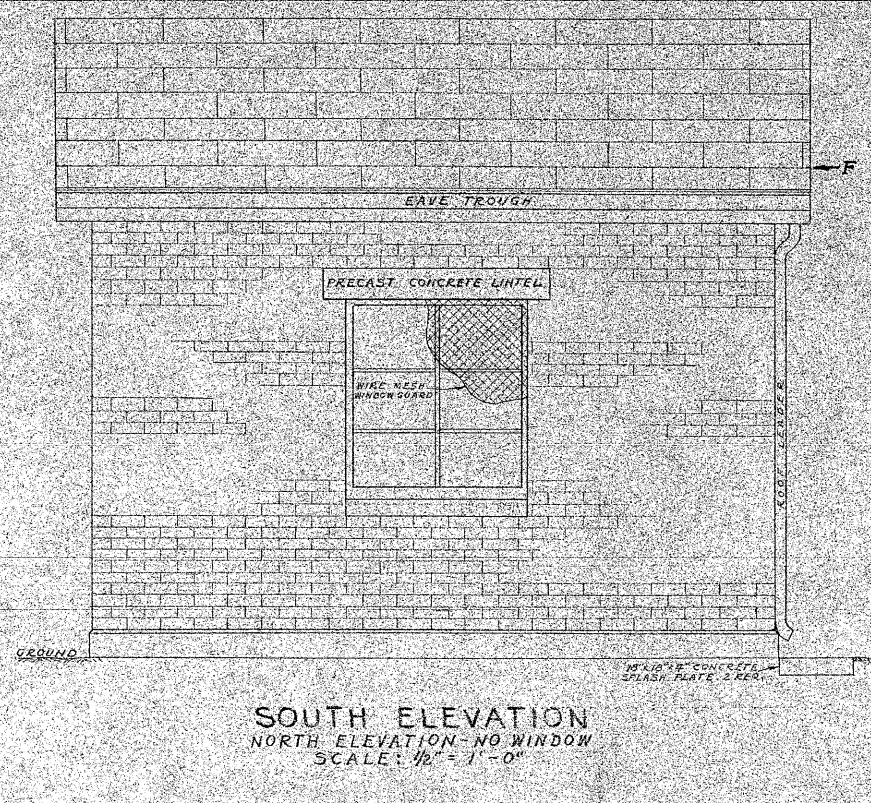
1963 Reports

Two sewage pumping stations on the easterly side of River Road in Agawam.

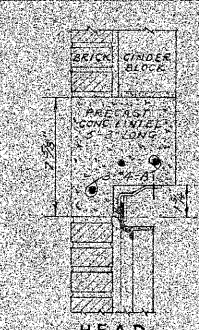
City/Town	Agawam
City/Town	Agawam
Streets	Campbell Drive
Streets	River Road
Streets	School Street
Water	Connecticut River



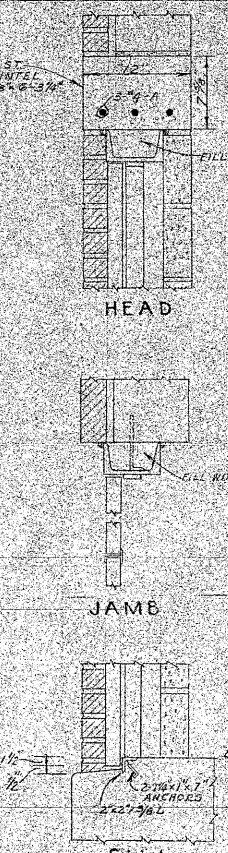
FRONT ELEVATION
SCALE: 1/2" = 1'-0"



SOUTH ELEVATION
NORTH ELEVATION - NO WINDOW
SCALE: 1/2" = 1'-0"

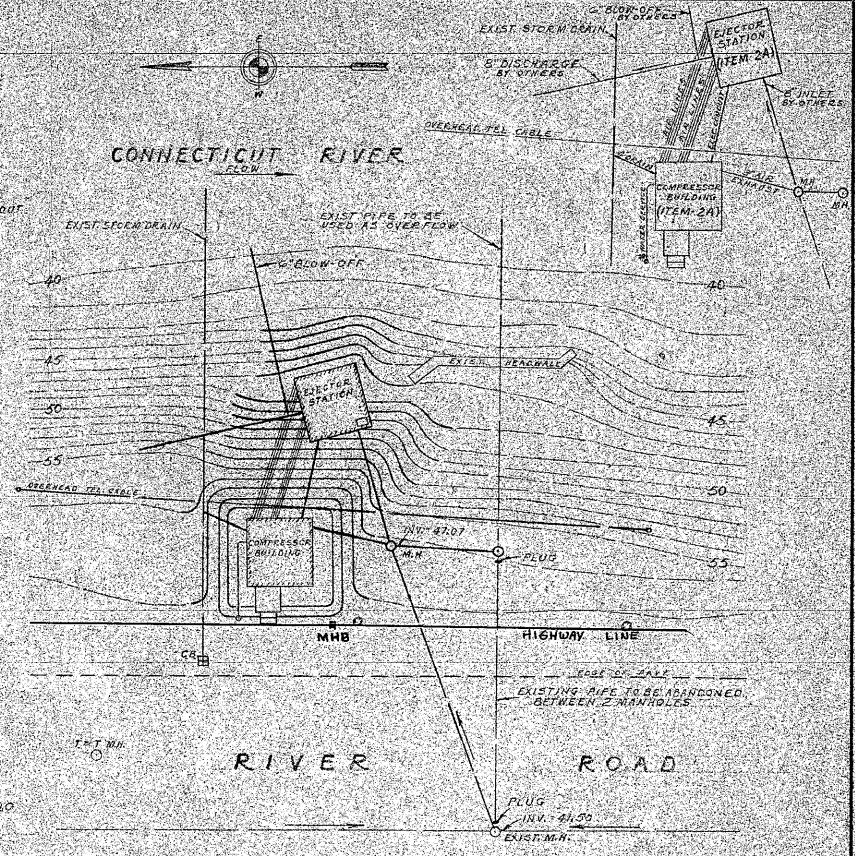


WINDOW DETAILS
NOT TO SCALE



DOOR DETAILS
NOT TO SCALE

NOTE:
DOOR AND WINDOW DETAILS FOR PUMPING STATION No.4 ARE THE SAME EXCEPT DOOR IN PUMPING STA No.4 IS 3'-0" x 6'-8" SINGLE LEAF DOOR.



PLOT PLAN
SEE SHEET 14 OF PLAN & PROFILE
SCALE: 1" = 20'

NOTE:
SEWAGE PIPELINES AND BLOW-OFF OUTSIDE OF PUMPING STATION NOT UNDER THIS CONTRACT.

DRAWN BY		CHECKED BY	
TRACED BY		APPROVED BY	
NO.	DATE	REVISIONS	BY

COMPRESSOR BUILDING
PUMP STATION - No. 6

CONNECTICUT RIVER
INTERCEPTING SEWER
BOARD OF SELECTMEN
TOWN OF AGAWAM, MASS.

TIGHE & BOND, CONSULTING ENGINEERS
HOLYOKE, MASS.

SCALE: AS SHOWN DATE: AUGUST, 1958

6

POMEROY ST.

RIVER

ROAD

NOTE
HOUSE CONN. SHOWN ACROSS HIGHWAY ARE EXISTING.

PROP. 16" A.C. CL. 100 SEWERAGE FORCE MAIN

EXISTING 8" A.C. CL. 2400 GRAV. SEWER

PROPOSED 10" A.C. CL. 2400 GRAV.

ALHAMBRA

BAY ST.

BERRY ST. EAST

SEWERAGE QUANTITIES ABOVE MH. R-8 "@ PRESENT"
EST. FUTURE POPULATION 96 (1960)
EST. FUTURE IND. DEVELOPMENT 18.3 ACRES (ULTIMATE)
EST. FUTURE PEAK FLOW 1.22 M.G.D.

NOTE
CHECK CONN. TO MH. 35 RECONN. TO SEW. MAIN IF R-8 IS CONNECTED TO EXIST. RIVER RD. MAIN

SEWERAGE QUANTITIES BETWEEN MH. R-8 AND MH. R-10
ESTIMATED FUTURE POPULATION 231 (1960)
ESTIMATED FUTURE IND. DEVELOPMENT 21.0 ACRES (ULTIMATE)
ESTIMATED FUTURE PEAK FLOW 0.72 M.G.D.

REVISED MAY 16, 1959

RIVER RD.

PROPOSED

CONNECTICUT RIVER INTERCEPTING SEWER, BOARD OF SELECTMEN, TOWN OF AGAWAM, MASS.

TIGHE & BOND CONSULTING ENGINEERS, HOLYOKE, MASS.

SCALE: HORZ. 1"=40' VERT. 1"=4'

AUGUST, 1958.

EXISTING MH. R-11

PROPOSED MH. R-11

EXIST. MH. R-10

PROPOSED MH. R-10

EXIST. MH. R-9

PROPOSED MH. R-9

EXIST. MH. R-8

PROPOSED MH. R-8

EXIST. MH. R-7

PROPOSED MH. R-7

EXIST. MH. R-6 RAISE CR. TO BE REMOVED

EXIST. MH. R-6 CONNECT INTO TO BE REMOVED

EXISTING 8" A.C. CL. 2400 GRAV. SEWER

PROPOSED 8" A.C. CL. 2400 GRAV. SEWER

PROPOSED 10" A.C. CL. 2400 GRAV. SEWER

PROPOSED 16" A.C. CL. 100 FORCE MAIN
MAINTAIN CONTINUOUS SLOPE

10" A.C. CL. 2400 S=.3/100 Q=0.000 M.G.D. V=2.57 F.P.S.

8" A.C. CL. 2400 S=.4/100 Q=0.00 M.G.D. V=2.42 F.P.S.

EXIST. 8" V.C. SAN. SEWER

EXIST. 15" V.C. SAN. SEWER

EXIST. 18" V.C. SAN. SEWER

EXISTING 8" A.C. CL. 2400 GRAV. SEWER

PROPOSED 8" A.C. CL. 2400 GRAV. SEWER

PROPOSED 10" A.C. CL. 2400 GRAV. SEWER

PROPOSED 16" A.C. CL. 100 FORCE MAIN

EXIST. 8" V.C. SAN. SEWER

EXIST. 15" V.C. SAN. SEWER

EXIST. 18" V.C. SAN. SEWER

CHARLES BRUNING COMPANY, INC.
PLAN PROFILE PLATE A

CHARLES BRUNING COMPANY, INC.
PLAN PROFILE PLATE A

6

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

February 1, 1963
A-86
Agawam Pumping Station

The Hon. Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Massachusetts

Gentlemen:

Reference is made to our letter of January 24, 1963, in which we requested for the Town of Agawam your permission for erecting a sewage pumping station on the easterly side of River Road approximately opposite School Street.

It has now come to our attention that Hampden County also owns the land between the easterly side of River Road and the Connecticut River in the area which is directly opposite Campbell Drive where it is proposed to construct a second sewage pumping station.

At this latter location, the installation will consist of a brick masonry compressor house which will be constructed on the flat area just east of River Road and a concrete walled pipe ejector station which will be constructed on the slope between River Road and the river. This latter structure will be practically all below ground except for its top and a relatively short section of wall on the downhill side.

We request that our letter of January 24, 1963, be amended so as to cover the construction of two pumping stations on land owned by Hampden County.

Possibly the authority for the construction of these pumping stations should be covered with an easement granted by your Commission to the Town of Agawam. We are sending copies of this letter as well as our letter of January 24th to Attorney John McDonough, Town Council for Agawam with a request that he confer with your Board at the earliest possible date.

TIGHE & BOND CONSULTING ENGINEERS

As explained previously, this project is to be partially financed by Federal Grant under the Public Works Acceleration Act. One condition of the Grant makes it imperative that the construction work be under way by early May. Before we can proceed with advertising bids, however, the town must have acquired the necessary land rights to construct the facilities. We will accordingly appreciate anything that your Commission may do to expedite approval of this request.

Enclosed is a copy of Sheet #14 of the construction plans for the Connecticut River sewer interceptor and Sheet #6 of the pumping station plans which show the proposed location for the pumping station opposite Campbell Drive.

We have previously sent you a plan which shows the proposed location for the pumping station opposite School Street.

Very truly yours,

Tighe & Bond

Edward J. Bayon
Assistant Chief Engineer

EJB/kas

Enclosure

Connecticut Valley Water Control Association



1954 Reports

National Rivers & Harbors Congress - 1954-1956.

Name	Conencticut Valley Water Control Association
Name	Boland, Edward
Water	Connecticut River

COPY

(POSTCARD)

NATIONAL RIVERS AND HARBORS CONGRESS

Second New England Regional Conference

Sheraton Hotel, Springfield, Mass. - October 15, 1954

Conference Starts 10:00 A.M. - Luncheon 12:45 P.M.

Please fill in and mail this card for reservations.

DO IT TODAY!

SIGNED .....

Firm or Ass'n .....

Mailing Address .....

Indicate How Many Others .....

Registration Fee $8.50

Including Conference Sessions; Luncheon; Brochure on N.E. Projects

COPY

COPY

36 Main Street
Agawam, Mass.

MEETING OF CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

On Friday, October 8th, at noon, a meeting of the Connecticut Valley Water Control Association was held at Tinti's Restaurant in Agawam.

Those Present were:

George McDonnell, representing Hampden County and S. Hadley
William P. Lawler, Engineer, Easthampton, Mass.
Thomas V. Hiner, Engineer, Longmeadow, Mass.
Edward A. Maher, City Engineer, Holyoke, Mass.
Conrad Hemmond, Holyoke Chamber of Commerce

It was noted that nothing had taken place concerning the Northampton matter since our last meeting. This city, we understand, is making plans to exceed their bonded indebtedness in case.

The group voted to have a bill drafted to file with the General Court, curbing the powers of Director Sterling until such time as action on our federal bill is taken.

Our joint meeting with the National Rivers and Harbors Congress, New England Region, to be held at the Sheraton Hotel, Springfield, next Friday, October 15th, was discussed.

It was voted that we procure printed programs and reservation cards from Larry Hess (Nat'l. Rivers and Harbors) and that we send out a bulletin to those cities and towns from the Conn. border to Brattleboro to try to stimulate interest and attendance. Mr. Hess was contacted by phone later in the afternoon and this detail taken care of.

The suggestion that our group also be contacted by phone later in the week, to remind them of the 15th meeting, was made.

Our group would like to have speeches mimeographed in advance so they could be taken home from the meeting. This suggestion will be passed on to Hess.

The chair was asked to procure circulars regarding new federal acts which make it possible to borrow government funds for sewer plans and construction, which circulars are to be sent to the members.

Frederick C. Emerson, President
Connecticut Valley Water Control Association

COPY

COPY

Agawam, Mass.
January 6, 1954

Meeting was held of the Connecticut Valley Water Control Association on January 6, 1954 at Tinti's Restaurant at 12 noon. Members present were as follows:

Conrad Hemmond
Chamber of Commerce
Holyoke, Mass.

Lloyd B. Cogswell
Planning Board
West Springfield, Mass.

George McDonnell
Hampden County & Consultant to So. Hadley
Holyoke, Mass.

Edward Maher
City Engineer
Holyoke, Mass.

Thomas V. Hines, Engineer
Longmeadow, Mass.

James Cahillane, Mayor
Northampton, Mass.

Frederick C. Emerson, Chairman
Board of Selectmen
Agawam, Mass.

A report was read concerning the progress being made on the Enfield Dam Project as reported by Mr. R. P. Stacy, Vice-President of the Connecticut Light and Power Company. They are still studying under the permit from the Federal power Commission and have about a year in which to finish their work. The engineering is being done by the firm of Jackson and Mooreland of Boston.

The Chair was asked to notify the Federal Power Commission of our interest in being represented at the hearing which they will hold when the Connecticut Light and Power Company requests their final permit.

There was considerable discussion over the letters received by various cities and towns in the area from the Director of the State Department of Public Health. It is indicated that most cities and towns in the area are expected by the State to start construction by 1955. Most communities have now, in the planning stages, such preliminary surveys. Final surveys in many cases will be considered during the early part of this year.

A telegram is being sent to Congressman Boland expressing the anxiety of the group over the submission of his resolution to the Congress of the United States. This wire has asked that the Connecticut Valley Water Control Association be kept posted as to when the hearing on the pollution and flood control bill mentioned, will be heard before the committee on public works.

Senators Saltonstall and Kennedy and Congressmen Boland and Heselton are being asked to advise our group as to their thoughts as to where our pollution and flood control prgram might fit in to any plans in development by the Federal Government that would be used in the event of a business recession. As Conrad Hemmond

COPY

The Connecticut Valley Water Control Association will meet Tuesday, May 15, 1956 at 12:00 noon at Tinti's in Agawam. Please make every effort to attend.

Sincerely,
Frederick C. Emerson, President

COPY

36 Main Street
Agawam, Mass.

MEETING OF CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

The Connecticut Valley Water Control Association met at Tinti's Restaurant, Agawam at noon on November 4th.

Those Present were:

Thomas Hines, Engineer, Longmeadow, Mass.
Edward A. Maher, City Engineer, Holyoke, Mass.
George McDonnell, Representing Hampden County and S. Hadley
William Lawler, Engineer, Easthampton, Mass.
Representative William Cowing, West Springfield, Mass.
Representative George Porter, Agawam, Mass.
Julius Meltzer, Springfield, Mass.
Henry Patnaude, Town Counsel, Agawam, Mass.
James Cahillane, Mayor, Northampton, Mass.
Fred Emerson, Selectman, Agawam, Mass.

Town Counsel (Agawam) Henry Patnaude presented a suggest draft of a bill that the group authorized written, the purpose of which bill is to temporarily curtail the activities of the state department of public health until such action as the U. S. Congress may take on pending legislation becomes final.

Representatives Porter and Cowing agreed to file the following:

"An Act to Suspend Temporarily the Enforcement powers of the Department of Public Health with respect to the Connecticut River."

(Emergency Preamble)

Be it enacted as follows:

1. "Chapter 111 of the General Laws is hereby amended by inserting the following new section 1C.

"Section 1C. The power granted to the Department to enforce orders, rules and regulations regarding the pollution of the Connecticut River and its tributaries in sofar as it applies to the Cities and Towns within the Commonwealth bordering and using the Connecticut River for the elimination of its sewage is temporarily suspended until the congress of the United States acts on House Bill #HR-8782, known as: 'A bill to Provide grants to municipalities for the construction of sewage treatment works to prevent and abate pollution of the Connecticut River and its tributaries.' This section shall remain in full force and effect, in any event, until July 1, 1960.

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MEETING OF CONNECTICUT VALLEY WATER CONTROL ASSOCIATION (CON'TD)
Noavmer 4, 1954

Julius Meltzer then gave us an interesting talk on the value of river navigation to our section. He pointed out the advantages of same to our locale both in growth of industry, increased employment, also cheaper power. Meltzer stated that a channel from Hartford to Springfield and Holyoke, 100 ft. wide and 11 ft. deep, would be adequate. His investigation into cost savings to the area showed that Westover Field would save $400,000 in transportation costs of oil alone and that Fisk would save about $60,000 per year in hauling of raw rubber. The Westover savings would be per year.

In the ensuing discussion, it appeared that navigation and the Enfield Dam were tied in together. Mr. Meltzer agreed to find out the present status of the Enfield Dam.

It was felt by the speaker that other transportation facilities would benefit by navigation. There was tremendous interest in the subject in 1946, but, at that time, opposition from the land carriers seemed to offset the efforts of those trying to get river navigation.

Frederick C. Emerson, President
Connecticut Valley Water Control Association

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Agawam, Mass.
February 17, 1954

Meeting was held of the Connecticut Valley Water Control Association on February 17, 1954, at Tinti's Restaurant at 12 noon. Members present were as follows:

George McDonnell
Hampden County & Consultant
to So. Hadley
Holyoke, Mass.

Thomas V. Hines, Engineer
Longmeadow, Mass.

Edward A. Maher, City Engineer
Holyoke, Mass.

James Cahillane, Mayor
Northampton, Mass.

William P. Lawler, Engineer
Easthampton, Mass.

Atty. Henry E. Patnaude
Town Counsel
Agawam, Mass.

F. M. Hennessy, Supt. Water Departmer
Northampton, Mass.

Frederick C. Emerson, Chairman
Board of Selectmen
Agawam, Mass.

Chairman Emerson reported that he had been advised by Representative George W. Porter that House Bill #937 has passed both branches of the State Legislature, and that same is now on its way to Washington. This was the bill filed in behalf of the association by Fred Emerson. It was a resolution which placed the General Court of the Commonwealth of Massachusetts on record in favor of the proposed Congressional action of our group.

The Chair also advised that our petition, submitted to the National Rivers and Harbors Congress, through their Regional Projects Chairman, Mr. Larry Hess, of Taunton, has received Mr. Hess' endorsement, also that the support of the National Rivers and Harbors Congress can be expected.

Atty. Patnaude is polishing up the proposed draft, after which it is being mimeographed to be sent to all towns affected in the valley, members of Congress, Senate, Governors, etc. With the proposed draft will go a letter of progress, advising of developments and seeking further support.

It was recommended that our group refrain from participation in the "Town Meeting" March 31st at Amherst, as it was felt that such action would be contrary to previously adopted policies of the association.

The next meeting date was left open awaiting developments on this project, with the chair authorized to call the group together when there is further progress to report.

Respectfully submitted,

Frederick C. Emerson, President
Conn. Valley Water Control Assn.

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stated, "Pollution is like Flood Control -- it crosses State Lines". The Connecticut River is controlled by the Federal Government and it is the thinking of this group, therefore, that any improvements on said river should be supported by their help, financially and otherwise.

The ASSOCIATION was pleased to have the newly elected Mayor James Cahillane of Northampton attend the get-to-gether. His enthusiasm over the work being done by our group was extremely encouraging.

The next meeting will be held at Tinti's Restaurant at noon on February 17th, 1954. Should an emergency arrive in the meantime, however, a special meeting will be called.

Respectfully submitted,

Frederick C. Emerson, President
Conn. Valley Water Control Ass'n.

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CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

Administration Building

36 Main Street Agawam, Massachusetts

March 10, 1954

Board of Selectmen
So. Hadley, Mass.

Gentlemen:

At a meeting of the Connecticut Valley Water Control Association, held at Tinti's Restaurant, Agawam, Atty. Henry E. Patnaude presented a form and draft of proposed legislation to be introduced in the Congress of the United States by Rep. Edward P. Boland, as it relates to the House of Representatives, and by Senator Leverett Saltonstall as it relates to the Senate.

The suggested proposals recognize that certain flood control reservoirs, for the safety and protection of persons and property in the lowlands and the valleys of the Connecticut River and its tributaries, already exist; that in order to provide greater safety and protection that more reservoirs should be constructed; that the rivers and streams of the Connecticut Valley should be devoid of pollution and wastes; that the Commonwealth of Massachusetts has ordered all cities and towns in the valley to provide for the removal of pollution; and that the State of Connecticut has already taken such measures as are necessary to eliminate pollution from the river valley.

It, the proposed bill, resolves that Congress enact such legislation as may be necessary, so that financial assistance may be granted to the cities and towns in the area for the removal and elimination of pollution by contributing at least 50% of the cost of sewage disposal plants, pumping systems connecting thereto in the various cities and towns in the valley.

Further provisions of the bill will be that the Congress of the United States authorize the Corps of Army Engineers to proceed with the construction immediately, of such flood control reservoirs as have already been planned, also to prepare, design and construct such other projects as they deem necessary for the protection of persons and property located in the Connecticut Valley. The proposed legislation further provides that funds be appropriated to accomplish the protection of flood control and the elimination of pollution as described above.

Chairman of the group, Fred C. Emerson, Agawam Selectman, reported that he has been advised by Rep. George W. Porter, that House Bill #937 has been passed by both branches of the State legislature, and that same is now on its way to Washington. This bill was a resolution, endorsed by the General Court of the Commonwealth of Massachusetts, lending support to the legislation to be filed by Rep. Boland and Senator Saltonstall.

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The association was further advised that the petition of the Connecticut Valley Water Control Association, submitted to the National Rivers and Harbors Congress through their regional projects chairman, Mr. Larry Hess of Taunton, had received Mr. Hess' endorsement and that the cooperation of the National Rivers and Harbors Congress in supporting the over-all project can be expected. All cities and towns, and their representatives in the Connecticut Valley will be advised by mail of this progress being made.

Present at the meeting were Mayor James Cahillane and Superintendent of the Water Department, F. M. Hennessy, representing the City of Northampton; William P. Lawler, Engineer from Easthampton; George H. McDonnell, representing Hampden County, also the Town of South Hadley; Edward A. Maher, City Engineer, Holyoke, Mass.; Thomas V. Hines, Engineer, Town of Longmeadow; Town Counsel, Henry E. Patnaude and Selectman Frederick C. Emerson, representing Agawam.

Yours very truly,

Frederick C. Emerson /s/

Frederick C. Emerson, President
Connecticut Valley Water Control Asso'n.

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FORM AND DRAFT OF PROPOSED LEGISLATION TO BE INTRODUCED IN THE CONGRESS OF THE UNITED STATES: BY SEN. LEVERETT SALTONSTALL AS IT RELATES TO THE SENATE AND BY REP. EDWARD P. BOLAND AS IT RELATES TO THE HOUSE OF REPRESENTATIVES OF THE SAID CONGRESS.

WHEREAS, it is recognized that certain flood control reservoirs for the safety and protection of persons and property in the valleys and low-lands of the Connecticut River and its tributaries have already been constructed, and

WHEREAS, it is recognized that in order to provide greater safety and protection for persons and property located in the valleys and low-lands of the Connecticut River and its tributaries additional flood control reservoirs must be provided; and

WHEREAS, it is recognized that the rivers and streams of the Connecticut Valley, all of which are controlled by the United States of America, should be devoid of pollution and wastes; and

WHEREAS, the Commonwealth of Massachusetts has ordered all cities and towns bordering on the Connecticut River and its tributaries to provide such measures as will effectively remove the same pollution and wastes; and

WHEREAS, the State of Connecticut has already eliminated pollution of the waters of the Connecticut River passing through its State, and, therefore, has a right to expect that the water coming into its State from the Connecticut River northerly and its tributaries be free from pollution;

BE IT RESOLVED AS FOLLOWS:

1. That the Congress of the United States enact such legislation as may be necessary so that financial assistance may be granted to the Cities and Towns in the area herein mentioned for the removal and elimination of pollution problems by a contribution of at least fifty per cent (50%) of the cost of sewage disposal plants, pumping systems connecting thereto in the various said Cities and Towns.

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2. That the Congress of the United States authorize, empower and direct the Corps of Army Engineers to proceed immediately with the construction of additional flood control reservoirs, the same having been previously recommended and to prepare, design and construct such other projects as they deem necessary for the protection of the persons and property located in the Connecticut Valley.

3. That appropriations of the necessary funds to accomplish the protection of flood control and the elimination of pollution as described herein be made by Congress.

4. That action hereunder be undertaken at the earliest possible moment.

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CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

Administration Building

36 Main Street Agawam, Massachusetts

N O T I C E

August 2, 1954

To: Members of the Connecticut Valley Water Control Association

It is very urgent that the members of the association meet to discuss and consider a joint bill in equity that would embrass a temporary restraining order against the State Department of Public Health, which action would be preparatory to the filing of a bill in the General Court. We also feel that all city solicitors should attend this meeting, and ask that you convey this message to them.

The meeting will be held at Tinti's on Thursday, August 12, at 12:00 noon. I sincerely hope you and your city solicitor will attend. Will you be kind enough to advise how many will attend so that reservations can be made.

Sincerely yours,

Frederick C. Emerson, President
Connecticut Valley Water Control Ass'n.

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36 Main Street
Agawam, Mass.

MEETING OF CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

On Thursday August 12, at noon, a meeting of the Connecticut Valley Water Control Association was held at Tinti's Restaurant in Agawam.

The following were present:

Henry A. Patnaude, Town Counsel, representing Agawam
George W. Porter, Representative, Mass. General Court, Agawam
Donald A. Robb, Supt. Public Works, Longmeadow
J. Bushnell Richardson, Jr., Chairman of Selectmen, Longmeadow
Lloyd B. Cogswell, West Springfield
Thomas F. Robinson, City Engineer, Chicopee
Joseph A. Nowak, City Solicitor, Chicopee
William M. Long, City Solicitor, Holyoke
John J. O'Connell, City Solicitor, Northampton
James Cahillane, Mayor, Northampton
Conrad Hemmond, Chamber of Commerce, Holyoke
Edward A. Maher, City Engineer, Holyoke

This was a special meeting called to discuss the advisability of either filing an injunction to test the strength of the present statue, or submitting a cill to be heard at the next session of the General Court.

It was decided to delay any further action on the above until Northampton received notice from Sterling that he was taking them to court.

Frederick C. Emerson, President
Connecticut Valley Water Control Association

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(Holyoke Chamber of Commerce)
Holyoke, Massachusetts

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THE COMMONWEALTH OF MASSACHUSETTS

Department of Public Health

State House, Boston 33

August 25, 1954

Mr. Conrad Hemond
Secretary-Manager
Holyoke Chamber of Commerce
Holyoke, Massachusetts

Dear Mr. Hemond:

This is in reply to your letter of August 14, 1954, relative to the Connecticut River. The Connecticut River has not been classified. The New England Interstate Water Pollution Control Commission has voted to collect special samples from the river during the present year with a view to classification approximately one year hence. Thus, as yet, one cannot describe fully the highest use to which the stream should be put.

If you have further questions in this regard, please do not hesitate to write.

Very truly yours,

Clarence I. Sterling, Jr.
Chief Sanitary Engineer

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(Holyoke Chamber of Commerce)
Holyoke, Massachusetts

August 14, 1954

Mr. Clarence I. Sterling, Director
Division of Sanitary Engineering
Department of Public Health
State House, Boston, Mass.

Dear Mr. Sterling:

Hass the Connecticut River in Massachusetts been classified as to its best use?

What are the uses to which it is put? - or should be put?

If a use classification has been determined, to what percentage must pollution be reduced to meet the requirement?

If answers to these questions are available we would appreciate them very much.

Appreciating your cooperation, we are

Sincerely yours

Conrad Hemond, Sec-Mgr.

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CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

Administration Building

36 Main Street Agawam, Massachusetts

September 22, 1954

Mr. George H. McDonnell
189 High Street
Holyoke, Mass.

Dear Sir:

A joint meeting of our Association and the National Rivers and Harbors Congress will be held at the Hotel Sheraton in Springfield on Friday, October 15, 1954. This will be an all day affair, with panel sessions in the morning, an outstanding speaker at lunch and discussions again in the afternoon.

The writer took the liberty of advising Mr. Hess that it was his opinion that his organization would cooperate to the best of our ability. I hope this meets with your approval, and that you will make every effort to attend. You will find enclosed a "Conference Call" together with a reservation card.

Among the speakers will be David G. Hammond, Assistant Division Engineer, U. S. Corps of Engineers; Mr. Harold F. Schnurle, Vice President, Central Main Power Company; Mr. Sterling St. John, North Atlantic Ports Association; Mr. Walter C. White, National Director, National Rivers and Harbors Congress; and Mr. Sylvan Martin, Chief of Field Operations, Water Supply and Water Pollution, Department of Public Health, Washington.

I feel that it would be advisable to hold a meeting of our group prior to the joint get-together, and have made reservations for October 7th, at 12:00 noon, at Tinti's in North Agawam. Would like very much to have you with us.

Sincerely,

Frederick C. Emerson, Chairman

Connecticut Valley Water Control Ass'n.

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NATIONAL RIVERS AND HARBORS CONGRESS
New England Region

c/o Association of Commerce
Taunton, Massachusetts

CONFERENCE CALL

The Second Conference of the New England Region, National Rivers and Harbors Congress, is being called by the National Directors; State Vice Presidents, and Regional Director of the New England Region.

This conference will be held at the Sheraton Hotel, Springfield, Massachusetts, on Friday, October 15th, 1954, and will be called to order promptly at 10:00 A.M. The Connecticut Valley Water Control Association is cooperating with the New England Region in sponsoring this conference.

The theme of the conference will be: "Water and Land -- Their Conservation, Development, and Use."

The purpose of the conference is three-fold:

EDUCATIONAL: To learn more about our water and land resources in New England;

FUNCTIONAL: To review our New England Projects, classified as Flood-Control, Pollution, Harbor Development, Inland Waterways, Hydro-Electric Power, Transportation, Erosion, and Reclamation.

ORGANIZATIONAL: To appoint a permanent projects committee for the New England Region; and to encourage better cooperation and understanding among the varied associations and organizations in New England, devoted in whole or in part to the development of water and land resources, with the National Rivers and Harbors Congress.

Arrangements are being made to present a program highlighted by the appearance of qualified speakers, who will develop the several topics of the conference theme.

All persons interested in the continued orderly development, conservation, and use for all beneficial purposes of the water and land resources of the New England Region are invited to attend and participate in this Second New England Regional Conference of the National Rivers and Harbors Congress.

Larry M. Hess /s/

Larry M. Hess
Regional Director

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December 7, 1954

REPORT OF THE CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

Presented to: - NEW ENGLAND - NEW YORK INTER-AGENCY COMMITTEE

At a Public Hearing, held in Springfield, Mass., on December 14th, 1954.

Subject: CONNECTICUT RIVER BASIN

Gentlemen:

For years, the Connecticut River Basin has been the subject of study and surveys, to determine needs covering such important subjects as Flood Control, Anti-Pollution, Navigation, Erosion and Power.

Cities and towns in this valley have been concerned about these problems, as they have about such other vital matters, principally the tremendous city and suburban growth, with their effects upon school systems, public utilities, etc.

This growth has placed tremendous burdens upon municipalities in the form of large bond issues to cope principally with our number one emergency, namely schools.

The Connecticut Valley Water Control Association was formed about three years ago to study principally anti-pollution and flood control. This group, incidentally, is made up of officials of cities and towns in this area.

After research, it was discovered that sewage construction necessary to clear streams, namely the Connecticut River and its tributaries, that it would cost approximately $49,000,000. of which $16,000,000. is needed for abatement of pollution.

To construct dams and reservoirs in Vermont, New Hampshire and Massachusetts, to help control flooding along the Connecticut River and its tributaries, for those dams and reservoirs planned but not constructed, $133,664,000. is needed.

It is the feeling of our association, as far as anti-pollution is concerned, that we need federal financial help. In behalf of the Connecticut Valley Water Control Association, Congressman Edward Boland was asked to file a bill, asking for participation by the government for 50% of the cost of these projects. The bill mentioned HR-8782 has been referred to the Committee on Public Works, who have, in turn requested a survey from the U. S. Department of Health, Education and Welfare.

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REPORT OF THE CONNECTICUT VALLEY WATER CONTROL ASSOCIATION (CONT'D)

The federal government has recognized our highway needs and they have taken positive action. Our needs for pollution abatement and flood control, principally anti-pollution, are very real. A positive approach by the government to these needs (which were recognized on a federal participating basis during the depression of the thirties) will be of tremendous help to cities and towns that are being over-burdened, if not strangled, by the problems of growth.

In this area, we have seen evidence of the tremendous value of flood control dams and reservoirs. At our request, Congressman Boland filed house bill HR 8826, calling for an expenditure of funds for a comprehensive survey and plans covering flood control needs affecting the Connecticut River and its branches.

Our association is principally interested in the two subjects mentioned. We have discussed navigation on an informal basis and are interested in whatever might be developed along this line.

The Connecticut Valley Water Control Association appreciates the opportunity to present this paper to the New England-NewYork Inter-Agency Committee. It is our hope that you will consider favorably our problems and so report to the President next year.

Respectfully submitted,

Fred Emerson, President

Connecticut Valley Water Control Assoc.

P.S. If there are any aspects of our problems presented that your committee would like to discuss with us further, or if there is any way we can help, we will be glad to assist you to the best of our ability.

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A special meeting of the association to discuss federal anti-pollution money and flood control will be held Tuesday, July 24, 1956 at 12 noon at Tinti's in Agawam. Important that you attend.

Please call Mrs. Arnold, Springfield Re 7-2616 if you are able to be there so that luncheon arrangements can be made.

Fred Emerson
Conn. Valley Water Control Assn.

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NEW ENGLAND-NEW YORK INTER-AGENCY COMMITTEE
150 CAUSEWAY ST.
BOSTON 14, MASS.

30 November 1954

Mr. George H. McDonnell
Chief Engineer
Tighe & Bond, Consulting Engrs.
189 High St.
Holyoke, Massachusetts

Dear Mr. McDonnell:

Your letter dated 24 November 1954 addressed to the Springfield Chamber of Commerce has been referred to me. Your inquiry concerns the availability of the reports on resources being prepared by the New England-New York Inter-Agency Committee.

The comprehensive report, when completed, will consist of about 40 volumes and will occupy approximately five feet of shelf space. The Committee has not been authorized, nor has it the facilities to reproduce and distribute copies of the report other than for the use of the members of the Committee and for display to the public as indicated in the notices of public hearings. The report will be submitted to the President of the United States about 30 June 1955, after which it is probable that either the President or the Congress will cause the report to be printed and made available to interested parties.

Basin reports will be available for inspection as indicated on the enclosed notice of public hearings. They are not available for takeout purposes.

Mr. Robert Scott, Deputy Commissioner of the Massachusetts Department of Commerce with offices at 334 Boylston St., Boston is Governor Herter's representative to the Committee. Mr. John Curry, Chief Engineer of the Connecticut State Water Commission, with offices at Room 317, State Office Building, Hartford, Conn., is Governor Lodge's representative to the Committee. Both these gentlemen receive copies of river basin reports as they are completed and it might be possible by direct contact to arrange for seeing the reports in one of their offices.

There is a copy of the reports in this office which you are at liberty to inspect, should you so desire. However, these cannot be loaned out.

Sincerely,

James R. Johnston /s/

James R. Johnston
Executive Secretary

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Notice

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NEW ENGLAND-NEW YORK INTER-AGENCY COMMITTEE
ROOM 1107, 150 CAUSEWAY STREET
BOSTON 14, MASSACHUSETTS

19 November 1954

NOTICE OF PUBLIC HEARING

1. In accordance with provisions in the Flood Control Act of 1950 and by direction of the President of the United States, the New England-New York Inter-Agency Committee is making a survey of the land andwater resources and related matters in the general area comprising the State of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont. A comprehensive report will be submitted to the President and will include recommendations of plans and programs to serve as guides for development, utilization and conservation of these resources.

2. The Committee is composed of one representative each from seven Federal Agencies -- Departments of Agriculture; Army; Commerce; Health, Education and Welfare; Interior; Labor; and the Federal Power Commission. The Governor of each State has appointed a representative to cooperate and work with the Federal representatives. The Governor's representatives are actively participating in the survey and in the preparation of the comprehensive report.

3. Public hearings were held during 1951-1952 in each of the seven States, at which public officials, organized groups and individuals availed themselves of the opportunity to present their views on resource matters. Intermittently, throughout the course of the survey, the Committee has received additional expressions of views from numerous sources. All the information and data presented have been considered by the Committee.

4. The survey is now nearing completion. The comprehensive report is being prepared on a river basin and subregional basis. Public hearings on these component sections of the report are being held in the affected areas in order that the Committee may obtain the views of interested parties on the findings of the Committee. Public hearings were held at Berlin, N. H. and Augusta, Maine on 9 and 10 November 1954, respectively. Hearings will be held at Concord, New Hampshire; Springfield and Boston, Mass.; Providence, Rhode Island; New Haven, Conn.; Montpelier, Vermont; and Albany, Syracuse and Buffalo, New York on the sections of the report affecting those areas. Notices of public hearings at these locations will be issued as the sections of the report are completed.

5. Several days prior to each public hearing, the reports on river basins and subregions to be considered at that hearing will be made available for public inspection at central locations in the affected areas. These places of inspection will be designated in the notice of public hearing. Interested parties are invited to inspect these reports and familiarize themselves with the contents in order that they may comment intelligently on them at the hearing, should they desire to do so. Representatives of the Committee will be available to assist persons in finding the subject matter in the reports in which they are interested.

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SCOPE OF HEARING

6. Each public hearing will consider only those reports on river basins or subregions included in the notice of public hearing.

PRESENTATION OF STATEMENTS

7. It is desired that individuals and representatives of groups wishing to be heard advise the Executive Secretary in advance of the hearing (at address given below), setting forth their name; address; name and address of the organization, if any, they represent; the hearing location at which they desire to beheard; and otherwise comply with procedure described in this notice. In the interest of facilitating the work of the Committee, it is desired that only one representative of any organization be heard. The authority of such an individual to represent the organization should be properly established in the advice to the Executive Secretary.

8. Statements presented should be confined to matters covered in the reports announced for consideration at the hearing. To facilitate comprehension of statements, specific reference should be made to the chapter; section; paragraph; table or plate in the report on which comment is made.

9. All statements will be heard, but for accuracy of record, it is requested that all important facts and arguments be submitted in writing to the Executive Secretary prior to the hearing. Individuals should be prepared to answer questions on their statements by members of the Committee. Both the oral and written statements and questions and answers will be made a part of the record of the hearing.

ANNOUNCEMENT OF PUBLIC HEARINGS

10. The third, fourth and fifth public hearings will be held at 10:00 AM, as follows: 14 December 1954 in the Mahogany Room, Springfield Municipal Auditorium, Springfield, Mass.; 15 December 1954 in the Hall of Records (Annex to City Hall), New Haven, Conn.; 16 December 1954 in Hearing Room 313, State House, Providence, R.I. The following reports will be considered at the three hearings:

Connecticut River Basin
Connecticut Coastal Area
Housatonic River Basin
Massachusetts Coastal Area
Merrimack River Basin
New Hampshire Coastal Area
Narragansett Bay Drainage Basins
Pawcatuck River Basin
Piscataqua River Basin
Rhode Island Coastal Area
Thames River Basin
Subregion "B"
Special Subjects, Subregion "B"

11. The reports listed in the preceding paragraph will be available for public examination as indicated below:

Date	CITY	ADDRESS
6 Dec 1954	Boston, Mass.	Mass. Dept. of Commerce, 334 Boylston St.
7 Dec 1954	Springfield, Mass.	Springfield Chamber of Commerce, 134 Chestnut St.
8 Dec 1954	Hartford, Conn.	State Water Commission, Rm 317, State Office Bldg.
9 Dec 1954	New Haven, Conn.	Conservation Program Bldg., 77 Prospect St
9 Dec 1954)	Providence, Ri.	(Corner of Trumbull St. Office Bldg
10 Dec 1954)		Division of Harbors & Rivers, Rm 218, State

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12. Please bring the foregoing to the attention of persons known to be interested in these matters.

13. Office of the Executive Secretary: Located in Room 1107, 150 Causeway Street, Boston 14, Mass. Telephone: LAfayette 3-8075.

James R. Johnston /s/

James R. Johnston
Executive Secretary

COPY

Received in Hampden County
Commissioners' Office on
August 17, 1956.

July 24, 1956

Report of the Connecticut Valley Water Control Meeting held at Tinti's Restaurant in Agawam, Tuesday noon, July 24, 1956.

Those present were: - William P. Lawler, Town Engineer, Easthampton; Pasquale Danniello, Selectman, Easthampton; Thomas F. Robinson, City Engineer, Chicopee; Katharine M. Root, Board of Selectmen, Easthampton; Harold P. Sauers, Wico Electric; Donald R. Robb, Supt. Public Works, Longmeadow; Edward A. Maher, City Engineer, Holyoke; Andrew C. Gallano, Wal ter T. Kerr, Irving R. LaFleur, Selectmen, Agawam; John P. Whalen, Town of West Springfield; James Cahillane, Mayor, Patrick Ryan, City Enginner, Northampton; James Atwater, Springfield Newspapers; Fred Emerson, Agawam.

The Chair reported on the status of the various flood control projects advise furnished him through the office of the Army Engineers. Word was also given to the group concerning the funds appropriated for various flood control projects in the Connecticut River basin.

It was mentioned that there was nothing new in the way of developments concerning the proposed Enfield Dam.

Most of the meeting centered around the passage of Senate Bill S-890, which authorizes appropriation of funds, as outlined in the Bill, for the purposes of the abatement of pollution. After considerable discussion, the group voted to send the following telegram to Senators Kennedy and Saltonstall, also Congressman Boland, Heselton, McCormick, and Martin - "Our group representing cities and towns in this area strongly urges the appropriation of funds for the abatement of pollution authorized under approved bill S-890."

Development since the meeting indicated that our work and also that of the individual communities as a result of the vote of the meeting paid off as funds were allocated.

At the meeting it was agreed that after the funds were appropriated, it would be up to the individual communities to seek their own portion thereof.

The meeting adjourned at 1:30 P. M.

Respectfully submitted,

Fred C. Emerson, President
Conn. Valley Water Control Assn.

EDWARD P. BOLAND
SECOND DISTRICT, MASSACHUSETTS

Congress of the United States
House of Representatives
Washington, D. C.

Received in
Hampden County
Commissioners'
Office on
August 17, 1956

July 30, 1956

Fred Emerson, Chairman
Connecticut Valley Water Control Association
Agawam, Massachusetts

Dear Fred:

Now that the second session of the 84th Congress has passed into history, I want to congratulate the association and you.

The great amount of work and detail that your organization put into amendments to the Water Pollution Control Act were significant in helping to solve a problem that faced the communities of Massachusetts. Your constant attention to this problem resulted in a victory that few thought possible. The providing of grants by the federal government to municipalities for the construction of pollution works is a complete departure from hitherto national policy. The allocation to Massachusetts for fiscal 1957 will come to $1,137,125. I am sure that this amount will not come anywhere near close to meeting the requests of applicants for assistance. However, the approved legislation is a great stride in the right direction and in time will be of great benefit to the Connecticut Valley.

The bill which I filed in February, 1955 was merged with similar bills to become the so-called Blatnik Bill providing for grants in aid of pollution control.

Again I congratulate the association and you for the fine work done over a considerable period of time.

With every good wish, I am

Sincerely yours,

Edward P. Boland

Edward P. Boland
Member of Congress

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REPORT OF THE MEETING OF THE CONNECTICUT VALLEY WATER CONTROL ASSOCIATION HELD AT TINTI'S RESTAURANT, AGAWAM, MAY 15, 1956.

The following were present:

J. P. Whalen, Jr., - representing the Town of West Springfield
Conrad Hemond - Holyoke
Paul F. Craig - Springfield Union
Ralph L. Barker - Barker Chemical Company
J. J. Cunningham - Connecticut Valley Block Company
Frederick C. Emerson - representing Agawam Board of Selectmen

Mr. Emerson reviewed the happenings of the Regional meeting of the National Rivers & Harbors Congress at which time support was given in behalf of our group for the Littleville Dam project, also for Federal aid for the abatement of pollution. Later, the Regional Director, Mr. Larry Hess and his committee favored Class I for the Littleville project.

Mr. Emerson represented the group at the National hearings in Washington where our project was eventually classified in group 2½ which, of course, was not as good as it was recommended out of the New England Meeting.

A report was given to the meeting concerning the action which was taking place in regard to House Bill No. 9540 and Senate - pass S. 890. The former bill was recommended by the Health Education and Welfare Department and has recently been approved by the Public Works sub-committee of the House. Congressman Boland assured the chairman of our organization that he w ould actively support House Bill No. 9540 when it came up for action on the floor of Congress. This House Bill provides for Federal Aid, whereas Senate bill does not.

A report was also presented by the chair concerning the rather unfortunate action that took place concerning the three or four bills that our group filed with the Massachusetts General Court. One of the bills had to do with the inspection of culverts, which we are advised can already be done by the Department of Public Works for certain state roads. Other action that we desired we later discovered is included in Chapter 513 of the General Laws of 1939, which allos the Department of Public Works to take whatever steps might be necessary for protection against flood by the removal of fallen trees, debris, and other obstacles in streams with the right to restore, repair, construction of or reconstruction of dams or other structures in or over rivers or streams, etc., and the right to enter private land for such purposes. The chair was requested by the group to ask for a report from the Department of Public Works as to what action took place last year in regard to this statute.

CONNECT VALLEY WATER CONTROL ASSOCIATION MEETING MAY 15, 1956

The principal discussion of the meeting was centered around the problem of uniting various groups toward the end result of getting better flood protection in the Connecticut River Water Shed. With this in mind, the chair was asked to make contact with the Westfield River Water Shed Council, the Connecticut River Water Shed Council, the County Commissioners in the counties of Western Mass., and other interested agencies.

The purpose of contadting these groups would be to call a meeting to discuss a long range program which would accomplish this desired result.

It was the sense of the meeting that our concern would be strictly with flood protection and not multi-purpose dams.

The chair was asked to obtain all the data possible from the United States Engineers concerning the status of all pending, present and other tentative projects that would effect the Connecticut River Basin and to also get the report from the New York, New England Inter Agency Committee concerning their recommendations for control of floods in this valley.

The chair was also asked to talk informally with Congressman Boland and Heselton to seek their comments in regard to this overall program.

The meeting adjourned at 1:40 P. M.

Respectfully submitted

Fred C. Emerson, President
Connecticut Valley Water Control
Association.

MARCH 8, 1957

ON GOOD AUTHORITY WE UNDERSTAND THAT THE CONNECTICUT LIGHT AND POWER COMPANY HAS BEEN SOLICITING PROPERTY OWNERS ALONG THE EDGES OF OUR STREAMS IN THIS AREA IN AN EFFORT TO GET THEM TO SIGN OFF ALL RIGHTS FOR COLLECTION OF DAMAGES IN THE EVENT THAT THE ENFIELD DAM IS BUILT. THEY ARE OFFERING $1.00 A FOOT.

FREDERICK C. EMERSON, PRESIDENT

CONNECTICUT VALLEY WATER CONTROL ASSOCIATION

Connecticut Valley Water Control Association - Map of Flood Control Projects in New England 1957



1957 Reports

Map shows New England Dam and Reservoir projects underway as of 1957.

Dam	Hampden County
Name	Massachusetts Comm

Connecticut Valley Water Control Association

January 7, 1957

County Commissioners
Elm Street
Springfield, Mass.

Gentlemen:

Thought you might be interested in the map being sent to you under separate cover, which is a part of the activities of the Connecticut Valley Water Control Association, namely to keep you posted and to do what we can in the interest of better control of water in our area.

Sincerely yours,

Fred Emerson

FCE:hml

Fred Emerson

21 Leonard Street
Agawam, Mass.

PREPARED BY STAFF, FLOOD COMMITTEE, ASSOCIATED INDUSTRIES OF MASSACHUSETTS

CURRENT SCOREBOARD ON NEW ENGLAND FLOOD CONTROL PROJECTS
UNDER JURISDICTION OF THE NEW ENGLAND DIVISION, CORPS OF ENGINEERS

PROJECT	APPROPRIATION 1957 F.Y.	SHOULD APPROPRIATE 1958 F.Y.	TIME REQ'D TO COMPLT. (YEARS)
CONNECTICUT RIVER BASIN			
Ball Mountain Reservoir, West River, Vt.	$ 2,300,000	$ 3,300,000	3.0
Moore Falls Reservoir, Ware River, Mass.	1,150,000	516,000	1.5
Cold River Reservoir, Cold River, N. H. (Not Authorized)	0	0	3.0
Graysville Reservoir, White River, Vt. (Needs State concurrence by Vt.)	0	0	4.0
Littleville Reservoir, Westfield River, Mass. (Not Authorized)	0	*200,000	3.0
Mad River Reservoir, Mad River, Conn. (Not Authorized)	0	*150,000	3.0
North Hartland Res. Ottauquechee River, Vt.	300,000*	1,000,000	5.0
North Springfield Res. Black River, Vt.	500,000	1,500,000	3.5
Otter Brook Res. Otter Brook, N. H.	1,250,000	2,500,000	2.33
Townshend Res. West River, Vt.	620,000	1,500,000	3.5
Victory Reservoir, Moose River, Vt.	0	*100,000	3.0
	5,120,000	10,786,000	
THAMES RIVER BASIN			
Buffumville Res. Little River, Mass.	1,200,000	1,430,000	2.0
East Brimfield Res. Quinebaug Riv., Mass.	840,000	1,800,000	3.0
Hodges Village Res. French Riv., Mass.	360,000	2,500,000	2.75
Westville Reservoir Quinebaug Riv., Mass.	0	*100,000	3.0
	2,400,000	5,800,000	
BLACKSTONE RIVER BASIN			
West Hill Reservoir, West River, Mass.	100,000*	100,000	2.5
Woonsocket Local Protection, Blackstone River, Rhode Island	1,100,000	2,000,000	2.33
Worcester Diversion, Kettle Brook, Mass.	340,000	1,800,000	3.33
	1,540,000	3,900,000	
HOUSATONIC RIVER BASIN			
East Branch Naugatuck River Res., Conn. (Not Authorized)	0	*150,000	3.0
Hall Meadow Brook Reservoir, Conn. (Not Authorized)	0	*150,000	3.0
Thomaston Reservoir Naugatuck River, Conn.	1,000,000	5,000,000	4.0
	1,000,000	5,300,000	
MERRIMACK RIVER BASIN			
Hopkinton-Everett Res. Contoocook River, New Hampshire. (Needs State of N. H. concurrence)	$0,000*	* 50,000	5.5
SUB-TOTAL	$ 11,510,000	$ 25,636,000	
PROJECT			
Northeast Flood Studies	120,000	300,000	
Hurricane Survey	958,000	800,000	
Passamaquoddy Survey	836,000	1,000,000	
Bush - McCormack Act. (Various small projects under $400,000)		3,500,000	
	1,914,000	5,600,000	
GRAND TOTAL	$ 13,424,000	$ 31,236,000	

*Planning funds only

CANADA

PROVINCE OF QUEBEC

QUEBEC

VERMONT

NEW HAMPSHIRE

MASSACHUSETTS

CONNECTICUT

RHODE ISLAND

NEW YORK

ATLANTIC OCEAN

MASSACHUSETTS BAY

CAPE COD BAY

NANTUCKET SOUND

LONG ISLAND SOUND

CONNECTICUT RIVER BASIN

HOUSATONIC RIVER BASIN

THAMES RIVER BASIN

MERRIMACK RIVER BASIN

BLACKSTONE RIVER BASIN

HURRICANE SURVEY
EASTPORT, MAINE
TO
GREENWICH, CONN.

PASSAMAQUODDY SURVEY

CANADA
UNITED STATES
MAINE
EASTPORT
CAMPOBELLO I.
GRAND MANAN I.
ST. ANDREWS

LEGEND

- COMPLETED
- UNDER CONSTRUCTION WITH F.Y. 1957 FUNDS
- UNDER CONSTRUCTION IF F.Y. 1958 FUNDS APPROPRIATED
- RECOMMENDED BUT NEEDS AUTHORIZATION (a)
- NEEDS RECOMMENDATION AND AUTHORIZATION (b)
- AUTHORIZED BUT NO MONEY REQUESTED FOR F. Y. 1958 (NEEDS STATE ACTION)
- PLANNING FUNDS ONLY REQUESTED FOR F. Y. 1958

(a) Recommended by Chief of Engineers awaiting Congressional approval.

(b) Pending submission of report by Corps of Engineers and Congressional approval.

SCALE N MILES
0 2 4 6

SEPTEMBER 1956

FLOOD CONTROL PROJECTS IN NEW ENGLAND

Dam Legislation Letter 1956 Worcester County Commissioners



1956 Reports

Letter dated June 29, 1956 from Francis E. Cassidy, Secretary & Treasurer of the County Commissioners' & Sheriff's Association in opposing the take over of dams by the Commonwealth of Massachusetts.

Dam	Hampden County
Name	Massachusetts Comm
Name	County Commissioners' & Sheriff's Association

COMMONWEALTH OF MASSACHUSETTS
Worcester County Commissioners
COURT HOUSE, WORCESTER, MASSACHUSETTS
TELEPHONE PLEASANT 6-2441

JOSEPH A. ASPERO, WORCESTER, CHAIRMAN
FRANCIS E. CASSIDY, WEBSTER
EDWARD P. BIRD, FITCHBURG

June 29, 1956

Honorable Ralph P. Walsh,
County Commissioner
Sprinfield, Massachusetts

Dear Commissioner Walsh:

Some time ago, our Association voted to oppose the taking over of dams by the Commonwealth of Massachusetts.

I have just received a telephone message from Commissioner Allen informing me that Senate 630 was passed by the Massachusetts Senate and that same is now before the House Ways and Means Committee.

Our Association, you remember, after listening to Leslie O. Marden, Worcester County Engineer, made a motion that we would oppose the taking over of any of our dams by the State because of the exorbitant expense that would be entailed in such a move.

I am sure our Association does not want to be relieved of our rights which we now have over said dams.

Will you please, immediately, get in touch with the Secretary of the House Ways and Means Committee and object to the passage of such Legislation.

As Secretary of our Association, I am writing a letter protesting.

Sincerely,

F. E. Cassidy

Francis E. Cassidy, Secretary and Treasurer
COUNTY COMMISSIONERS' AND SHERIFFS' ASSOCIATION

FEC/ja

East Longmeadow Dam Inspections - 1956 - 1963



1956 Reports

Inspections by Tighe & Bond.

City/Town	East Longmeadow
Dam	Dietrich Dam
Dam	Wetstone Tobacco Company Dams
Dam	Forest Park Dairy Dam
Streets	Shaker Road
Streets	Denslow Road
Water	Crescent Lake
Water	Jawbuck Brook
Water	Fresh Water Brook

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

C.D. E. Longmeadow
Nov. 30, 1956

The Hon. The Board of County Commissioners
Hampden County Court House
31 Elm Street
Springfield, Mass.

Gentlemen:

Recent inspections of dams in the Town of East Longmeadow have now completed the inspection routine in this community and all dams have been examined once or more times during 1956. The following is a report on the condition of the various dams situated in East Longmeadow.

A. Forest Park Dairy Dam (A. H. Dietrich)

This is a small dam located westerly of Shaker Road on the headwaters of Jawbuck Brook that drains thru the property of Wetstone Tobacco Co. and to Shaker Pond in Connecticut. The dam is constructed of earth and prior to the flood of August, 1955, had a small pipe spillway and a turf-paved emergency swale spillway. During the flood of August, 1955, the dam was washed thru in the location of the swale spillway. The owner discussed the possible reconstruction of this dam following the August flood, but plans and specifications of the proposed work were never properly prepared and filed. During 1956, apparently in the summer, the owner partially plugged the breach thru the dam in order that water would be ponded behind the structure. The plug is not properly made nor has an adequate spillway been prepared at this dam. The owner should be directed to breach the dam and to cease ponding water at this location until proper plans and specifications for a dam and spillway are prepared, filed and approved.

B. Wetstone Tobacco Co. Dams

There are three dams on the property of the Wetstone Tobacco Co. All three of these dams were damaged and washed thru in the flood of August, 1955. Since that time the owner has had plans and specifications of new dams prepared, filed and approved. Two of the dams are located on Jawbuck Brook, one to the north of Denslow Road and the other to the north of the Connecticut-Massachusetts state line. Both of these dams have been reconstructed with well compacted earth, and have been loamed and seeded. The spillway at each of these two dams is a concrete overflow section of generous capacity. The dams have been built in accordance with the approved plans

and specifications. Certain minor maintenance is required at these two structures and this work has been pointed out to Mr. Wetstone at a recent inspection.

The third dam is located on Fresh Water Brook that drains to Crescent Lake. The dam is westerly of Shaker Road and northerly of the Connecticut State Line. This dam is an earth embankment having a tube and vertical shaft spillway. The spillway is of the treated corrugated iron type of construction. An emergency swale spillway with a concrete cutoff wall has been prepared at the left end of the dam. When last inspected, this dam was in very good condition. Immediately downstream from the end of the tube spillway there is a possibility that an erosion will occur at time of high flow discharge. This condition has been pointed out to Mr. Wetstone and a suggestion made that a stilling basin be provided in the stream bed just below the discharge end of the tube.

There are four dams in East Longmeadow that come under County control. All four suffered damage in the flood of August, 1955. Three have been well and properly re-built. The fourth, owned by A. H. Dietrich, should be abandoned and breached or properly repaired.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/f

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

Cd E. Longmeadow

Jan. 3, 1958

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Gentlemen:

Inspections of dams recently completed in the Town of East Longmeadow have resulted in all dams being examined one or more times during the year 1957. The following is a report on the condition of the various dams situated in the Town of East Longmeadow.

A. Forest Park Dairy Dam (A.H. Dietrich)

Conditions at this dam are about the same as those that have existed since the flood of August, 1955. A breach was washed thru the dam as the result of the flood water and the breach has been partially plugged by the placing of earth in the opening. This plug is not properly made nor is there a proper and adequate spillway for this dam. The owner should be directed again to breach the dam and to cease ponding water at this location until proper plans and specifications for a new dam and spillway are prepared, filed and approved and then construction completed.

B. Wetstone Tobacco Co. Dams

Dam #1 at Denslow Road This dam is in very good condition.

Dam #2 on Freshwater Brook This dam is in very good condition.

Dam #3 on Jawbuck Brook This dam is in very good condition.

Respectfully submitted,

George H. McDonnell
County Hydraulic Engineer

GEORGE H. MC. DONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON
TEL. JEFFERSON 3-3991

TIGHE & BOND

CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
SUPERVISION OF CONSTRUCTION AND OPERATION
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS

CD E. Longmeadow

Nov. 6, 1958

The Hon. the Board of County Commissioners'
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

Inspections of dams recently completed in the Town of East Longmeadow have resulted in all dams being examined one or more times during the year 1958. The following is a report on the condition of the various dams in the Town of East Longmeadow.

A. Forest Park Dairy Dam (A.H. Dietrich)

Conditions at this dam are still the same as reported last year. A pond is formed by a plug of earth placed in the breach washed thru the dam in the flood of August, 1955. This earth plug is makeshift and the overflow consists of a pipe laid thru the plug. When last inspected, it was noted that debris was partly blocking this temporary and unsatisfactory overflow.

Heavy storm runoff can exceed the pipe capacity and will overflow the plug of earth placed in the breach. The owner has been notified of the unsatisfactory condition of this dam in the past. He should be directed to breach the dam and to cease ponding water at this location until proper plans and specifications for a new dam and spillway are prepared, filed and approved, and authorized construction completed.

B. Wetstone Tobacco Co. Dams

Dam #1 at Denslow Road The earth embankment sections and the concrete spillway of this dam are in good condition. The embankment toe just to the left of the spillway is wet as the result of seepage but this condition, existing since the dam was built, shows little or no change. There is no flow of water from this wet area. The dam is satisfactory for the present time.

Dam #2 on Freshwater Brook This dam was found to be in excellent condition. Both the main spillway and the swale spillway were found free and clear of debris and in good condition.

Dam #3 on Jawbuck Brook The concrete overflow spillway and the dam embankment on both ends of the spillway are in very good condition.

Respectfully submitted,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD East Longmeadow
July 30, 1963

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

Inspections of dams within the Town of East Longmeadow have been conducted from time to time during the year 1963 and all dams situated in that community have now been inspected at least once during this year. The general condition of the dams in East Longmeadow is as follows:

A. Forest Park Dairy Dam (A. H. Dietrich)

This dam, breached in the flood of 1955 and reactivated in violation of the Law from time to time since then, has been rebuilt and relocated in part, particularly the right portion of the embankment. A large earth embankment has been formed that is of good mass for the low height involved. A typical tube spillway with vertical shaft and horizontal pipe thru the embankment has been installed, together with a horizontal pipe from the bottom of the vertical shaft back into the pond for draining purposes. A swale spillway has been shaped across the embankment and some riprap placed at the entry to the swale. No sod or turf is in the swale spillway. The discharge end of this emergency spillway is at the end of the new embankment section and consists of a near vertical drop off of the embankment. High rates of flow thru this spillway will cause erosion of the embankment at its discharge end and this erosion will eat back across the embankment, if flood flow continues for any length of time. An end wall to protect the embankment should be built or the discharge end of the swale spillway should be filled with a large mass of heavy rock.

To my knowledge no plans and specifications have ever been filed for this reconstructed dam and the Owner has activated the structure,

in the opinion of the undersigned, in violation of Chapt 253 of the General Laws.

In addition to constructing the dam without filing plans and specifications, the Owner has constructed a small dam downstream thereof that contains very little water and consequently does not greatly endanger persons and property downstream. However, the embankment of the dam is poorly built; it is doubtful that a proper foundation was prepared before the embankment was placed and the spillway is nothing more than a sand-bag lined channel in a notch in the embankment. In the opinion of the undersigned, this small dam will be washed out in the first heavy flood flow.

The Owner in this case has been notified from time to time in the past regarding the requirements of the Law for constructing, repairing and maintaining dams. Recommendations made to him and instructions given regarding the proper procedure for reactivating an old dam have been disregarded by him over the past few years. It is recommended that the Owner be notified again that he is in violation of Chapt. 253 of the General Laws, based upon the dams he now has in operation and that he be given 30-days to either comply with the Law or your Honorable Board take the necessary steps to breach both dams.

B. Wetstone Tobacco Co. Dams

Dam #1 at Denslow Road The embankment sections of this dam are quite rough and are becoming overgrown with weeds. However, they are massive and safe. The concrete spillway was found to be in very good condition and water level in storage was at the crest of the spillway.

Dam #2 on Freshwater Brook The embankment at this dam should be cleared of heavy brush and weed growth. A good turf growth should be promoted. The tube spillway was in good condition and the swale to the left of the embankment section of the dam was found to be in very good condition. Water level in storage was at the crest of the tube spillway on the day of inspection.

Dam #3 on Jawbuck Brook Both embankment sections at this dam must be cleared of all brush and tree growth. Growth has now become so thick that a proper inspection of the embankment sections of the dam cannot be properly made. Turf growth should be promoted at this dam.

The concrete spillway was found to be in excellent condition and the water level in storage was at the crest of the structure.

Following the inspection of these three dams, the undersigned met

with the Owner, Mr. Julius Wetstone and went over the recommendations regarding maintenance of the dams. Mr. Wetstone will have all brush and tree growth removed from the embankment sections and will take steps to promote a turf growth. Because of my conference with Mr. Wetstone and his promise to clear the dam embankments, there is no need to send a letter of recommendation.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

Eastern Photo Supply Company vs Berman's Motor Express Inc



1956 Reports

Sudden flooding on Route 20 in Westfield.

Abutters	Tekoa Country Club
City/Town	Westfield
Name	Eastern Photo Supply Company
Name	Berman's Motor Express Inc
Streets	Route 20

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
STRUCTURAL ENGINEERING
ELECTRICAL ENGINEERING

TIGHE & BOND, INC.
CONSULTING ENGINEERS
BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991
GEORGE H. McDONNELL
PHILIP W. SHERIDAN

DAMS & POWER INSTALLATIONS
HIGHWAYS & BRIDGES
HOUSING DEVELOPMENT
WASTE DISPOSAL

CD Westfield
March 26, 1957

The Hon. the Board of County Commissioners
Hampden County Court House
Springfield, Mass.

Gentlemen:

Enclosed please find a copy of a letter received from Edwin Ross Trafton, Atty of 70 State St., Boston, Mass. The contents of this letter are self explanatory. Also enclosed is a copy of our letter to Atty Trafton. The enclosed letters are for your files on this case, should further information be requested by Atty Trafton.

Very truly yours

George H. McDonnell
County Hydraulic Engineer

Enc.
GHM/cmb

COPY

CD Westfield

March 26,1957

Edwin Ross Trafton, Atty
70 State Street
Boston, Massachusetts

Dear Sir:

Reference is made to your letter of March 25, 1957 regarding flood water on Rte 20 in Westfield, Mass., on Aug. 19, 1955. According to your letter you request assistance in establishing the bursting of some dam on Rte 20, Westfield, Mass., opposite hole #18 of the golf course.

I presume the location is just westerly of the built up portion of Westfield and in the vicinity of the Tekoa Country Club. To the south of Rte 20, in this general location, there is no dam located in the higher level land that would come under the inspection routine and work of this office.

According to our records and information in this office, there would not have been a sudden rush of water as mentioned in your letter at the location pin-pointed as the result of the bursting of any dam to the south.

Westfield River is located to the north of the highway and it might be that the sudden rise in water was related to the flow in this stream.

I am sorry that I cannot give you any further information on this case as of the present time. If you would care to discuss the matter more fully, I would be pleased to have you call, write or visit this office and discuss the matter more fully. Perhaps further questioning of the driver of the truck would indicate the direction from which the sudden rush of water originated. This information would help the undersigned in trying to relate this rush of water to some upstream fact or condition.

If you do care to discuss this matter further, will you be certain that the truck driver agrees with the location of his vehicle as described hereinabove?

Very truly yours,

COPY

EDWIN ROSS TRAFTON
Atty at Law
70 State St.
Boston 9, Mass.

Lafayette 3-8386

March 25, 1957

Mr. George McDonnell
c/o Tighe & Bond Consaltant Engineers,
Holyoke, Mass.

Dear Sir: Re: Eastern Photo Supply Co., vs Berman's Motor Express Inc.

The Boston office of the Corps of Engineers, has furnished us with your name in that you might be able to assist us in establishing the bursting of some dam on Route #20, Westfield, Mass., opposite hole #18 of the golf course on August 19, 1955.

We represent Berman's Motor Express, Inc., whose driver reports that on the above date, as he was driving on Route #20, at the place indicated, there was a sudden rush of water which inundated the trailer-tractor, and he found it necessary to escape through a window of the cab and swim approximately 150 yards to dry land. Subsequently, he was advised that a dam had burst causing the flooding of Rte #20.

Any information which you can furnish us in identifying the dam or the facts pertaining thereto would be appreciated. Enclosed herewith is a self addressed envelope for your convenience.

Very truly yours

Edwin R. Trafton

ert:a
enc.

Granville Dam Inspections - 1959 - 1970



1959 Reports

Inspections by Tighe & Bond.

Abutters	Granville State Forest
City/Town	Granville
Dam	Starzyk Dam
Dam	Winchell Dam
Dam	Noble-Cooley Drum Shop Dams
Dam	Phelon Dam
Dam	Jarm Dam
Dam	Jensen Dam
Dam	Woodger Dam
Dam	Japhet Dam
Dam	Wells Mills Dam
Dam	Dickinson Dam
Dam	Granville Reservoir Dam
Dam	Arnold Dam
Dam	Wagner Dam
Dam	Dickinson, Glenn, Dam
Dam	Noble, Don, Dam
Dam	Cooley Estate Dam

Dam	Westfield Water Department Dams
Dam	Degano Dam
Dam	Strong Dam
Dam	Granville State Forest Dam
Water	Granville Reservoir
Water	Cooley Lake

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Granville
October 2, 1959

The Hon. the Board of County Commissioners
Hampden County Court House
37 Elm Street
Springfield, Mass.

Gentlemen:

Recent inspections of dams located in the Town of Granville have completed the inspection routine in that community and all dams situated in Granville have now been examined one or more times during the year 1959. The following is a report on the condition of these dams.

A. DeGano Dam

This dam was found to be in very good condition. The embankment is well shaped and shows no sign of settling or erosion. The masonry of the spillway conduit under the Town Road is good.

B. Starzyk Dam (Now Richard Wagner)

Conditions were found to be satisfactory at this dam. Water is ponded within about 18" of the lip of the spillway tube. The toe of the dam was checked for seepage noted in 1958. Very little seepage is now present and the toe area can be considered reasonably dry. The embankment is somewhat rough in shape but is sufficiently large in cross section considering the head of water involved. This dam and spillway are satisfactory for the present.

C. Woodger Dam

This dam is still under construction as the result of damage in the flood of August, 1955. The structure does not come under County jurisdiction since the dam is just under 10 ft. in height, the drainage area is but a fraction of a square mile and the quantity of water ponded is very small. The dam is inspected annually since a slight increase in height would result in the structure being higher than 10 ft. above the stream bed.

On the day of the last inspection the owner was in the process of concreting the spillway section under the adjacent roadway. He plans to mortar the stone masonry composing the spillway walls and roadway bridge abutments. The dam is now so arranged that at time of heavy runoff the excess flow can pass over the entire length of the dam and then flow in rock lined channels to the roadway culvert. The dam as existing is satisfactory.

D. Noble-Cooley Drum Shop Dams

There are three dams in connection with the Noble-Cooley Drum Shop. The condition of these dams is as follows:

Upper Dam This was formerly a small diversion dam and has not been active for many years. In the flood of August, 1955, a wide breach formed at the dam and a free waterway now allows for passage of all rates of brook flow without ponding water.

Middle Dam Repairs and maintenance previously recommended have not been done. Masonry spillway walls and the spillway itself need attention and repairs. Brush growing along the length of the dam should be completely cut down so that proper inspections can be made and the dam embankment maintained as needed.

Lower Dam The dam and spillway are in good condition. At the time of the last inspection, the pond was found to be lower in elevation than noted in many years. No flow was seen in the brook. The drainage area is apparently very dry.

E. Dickinson Dam

This dam was found to be in satisfactory condition. Hardly any water is stored because of the very low height of this dam. The dam consists of a full spillway section across the stream. The dam formerly diverted water to a small mill canal that is no longer in operation.

F. Glenn Dickinson Dam

This dam is still in poor condition. Water level in the pond was found to be quite low and it would be advisable to maintain a low water level at all times until proper spillway repairs are made.

The embankment section of the dam has been improved somewhat by the addition of a sandy soil. No improvement has been made to the outlet end of the large emergency spillway tube thru the embankment. Water

flowing thru the tube washes embankment material from the end of the tube. This spillway should be extended to properly discharge water onto natural ground.

The Glenn Dickinson Dam does not come under County jurisdiction but is a borderline case in that the height of the dam is just under 10 ft. Since it is a borderline case, it is inspected annually. It is recommended that the comments regarding the condition of the dam be sent to Mr. Glenn Dickinson in order that he may take the necessary steps to protect his dam from failure if he so desires.

G. Don Noble Dam

Some work has been completed at this dam to improve the embankment and the pipe spillway. When last inspected it was noted that the spillway tube had been extended with corrugated iron pipe to provide for the discharge of overflowing water to natural ground at the toe of the dam. The upstream face of the embankment appears to have been covered with a layer of impervious silt and mud probably excavated from the floor of the pond just upstream from the dam.

At the right end of the dam the recommended swale spillway has not been built. The owner of this dam should construct the swale spillway immediately. The pipe overflow thru the earth embankment does not have sufficient capacity to properly pass flood flows. Without the swale spillway, this dam may be overtopped and washed out again.

At the time of the last inspection, no water was found stored in the pond though the drawoff pipe valve was closed. An examination of the pond bottom showed no water on the drainage area to provide for the formation of a pond. The drawoff pipe gate should be opened and should remain open until the recommended swale spillway is properly constructed.

The entire area of the embankment of the dam should be cleaned of brush and small tree growth.

H. Cooley Estate Dam (Cooley Lake)

This dam was found to be in very good condition. However, masonry walls of the spillway structure show signs of disintegration at the point where the walls join the floor. Repairs should be made to this masonry in the near future.

The swale spillway was found to be satisfactory. Two small low areas in the spillway at the road crossing could be re-graded for drainage

purposes to stop the formation of nuisance puddles. Spillway boards in the main spillway structure should be removed and kept off of the spillway in advance of the fall rains and should not be replaced until after the spring rains.

I. Westfield Water Department Dams

(a) Arnold Dam This dam was found to be in satisfactory condition. The pond was found to be full and the embankment satisfactory.

(b) Wells Mills Dam The same conditions as noted in previous inspections were found to still exist. Flood damage caused in August, 1955 has never been repaired. At present, the pond is completely full of sand and gravel and hardly any water can be stored. The dam is not in a dangerous condition nor does it endanger persons and property downstream since even in flood time, it will store little or no water and shows no signs of general weakness. If the purpose of this dam is to provide a pond for fire control purposes on the watershed area, then the dam should be maintained and a portion of the pond area cleaned out by excavating flood washed in sands and gravel.

(c) Strong Dam This dam was found to be in satisfactory condition. Recommended repairs to the swale spillway as pointed out in the report of last year have been made and this structure is now in very good condition. All brush and miscellaneous growths have been cleared from the dam.

(d) Granville Reservoir Dam The embankment at this dam was found to be in good condition. Seepage at the toe of the embankment was noted to be about normal. At the end of the concrete spillway chute, there is need for maintenance by the placing of mass concrete. Action of overflowing water will cause further erosion and wear on the rock at this location and the placing of mass concrete fill at this point will prevent erosion of the rock to a point where a dangerous condition might occur that could damage the foundation at the end of the spillway chute.

(e) Winchell Dam This structure was found to be in very good condition. No flashboards were on the spillway crest.

(f) Japhet Dam This dam is in excellent condition and no flashboards were on the spillway crest.

J. Granville State Forest Dam

The dam and spillway are in good condition. There is evidence of repair work being done this year to the right of the spillway by the placing of cobble and field stones in what probably was a worn or washed out area of the embankment. The dam and spillway seem to be well maintained.

K. E. A. Jensen Dam

The spillway at this dam was found to be in very good condition. Brush and tree growth has all been removed in accordance with previous recommendations.

The embankment is in good condition except for one small area at the top center near the downstream edge. A small turf slide a few feet square in area should be repaired and graded. In general, the grass growth on the embankment is good.

Water still runs from the drawoff pipe thru the embankment. However, the water is running inside the pipe, is clear and shows no evidence of carrying silt or fine soil particles. No evidence of settlement in the embankment directly over the pipe location could be noted. Therefore, it is assumed that the leakage into the pipe is occurring in the pond area or in a portion of the embankment but causing no movement of soil.

L. Jarm Dam

This dam is still in the same condition as noted last year. The structure is fairly well built and as now existing, does not come under County jurisdiction. It is checked from time to time to be certain that it is not increased in size so as to come within County control.

Respectfully submitted,

George H. McDonnell
County Hydraulic Engineer

GHM/mb

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Granville
Sept. 13, 1961

The Hon. the Board of County Commissioners
Hampden County Court House
Elm Street
Springfield, Massachusetts

Gentlemen:

Recent inspections of dams situated within the Town of Granville have completed the inspection routine in that community and all dams located in Granville have now been examined at least once during the year 1961. The following is a report on the general condition of each of the dams in Granville.

A. DeGano Dam

The spillway, embankment and the roadway culvert were all found to be in satisfactory condition. Stop boards in the spillway notch are about one-half up the height of the masonry structure. This is the normal position for stop boards in this spillway.

B. Phelon Dam (Formerly Wagner)

A special letter report was submitted in connection with this dam. In summary, the special report pointed out that the spillway tube of the dam had been found blocked by a heavy iron screen which in turn had been plugged with mud, sticks and debris. At one time in the recent past, the pond level had increased in height to a point where water flowed over the earth embankment. The Owner was notified in connection with this matter and a communication was recently received whereby the Owner has agreed to consider the construction of a swale spillway and the inclusion of further improvements to prevent future over flow of the earth embankment.

C. Woodger Dam

Conditions at this dam were the same as reported last year. The dam still does not come under County jurisdiction since it is on a

very small drainage area, stores but a small fraction of a million gallons of water and is only about 9 ft. in height. The height is checked annually to be certain that the Owner does not raise the dam to above 10 ft. The dam was found to be in satisfactory condition and the masonry in a reasonably good state of repair.

D. Noble-Cooley Drum Shop Dams

Two active dams now remain at the Noble-Cooley Drum Shop. The upstream diversion dam was breached in the flood of August 1955 and has never been repaired. It is not expected that this dam will ever be reactivated.

1. Small dam above mill. The masonry at the spillway in this structure and at the side wall to the right of the spillway just below the spillway crest is in need of certain maintenance and repair. Also, brush growth along the embankment is very thick and an inspection of the embankment could not be made because of the thick growth. It would be advisable for the Owner to keep this growth cut down so that inspections can be made from time to time and the need for any maintenance recognized at an early date.

2. Small dam below mill. This dam is in the same general condition as reported previously. The embankment and the road, as well as the spillway itself, were all found to be in satisfactory condition. The small dike situated at the left of the dam embankment, though low and small, is satisfactory.

E. Dickinson Dam

This dam is in the same general condition as reported a year ago. The stone masonry portion of the structure at the right end, the concrete masonry portion in the center section and the log construction portion at the left were all found to be in a good state of repair. Conditions as noted at the dam are satisfactory.

F. Glenn Dickinson Dam

This dam is still in the same general condition as reported in previous years. The embankment is of sandy material, it is narrow and has steep slopes. In general, the embankment has been poorly constructed. The large overflow tube thru the embankment discharges water on the downstream face of the sandy

fill and as the result a deep washout of this fill has occurred. This dangerous condition has been pointed out from time to time in the past and the Owner has taken no steps to prevent a continuation of the washing action.

At the time of the last inspection, it was noted that stop planks were not in place in the spillway box, except for two small planks near the bottom. The flow of the brook is passing directly into the stop plank structure and thru the dam in the drawoff pipeline. Hardly any water is stored and from the growth of vegetation on the bottom of the pond area, no water has been stored for some time.

From all appearances it would appear as if the pond has been abandoned and will no longer be actively used.

This dam still does not come under County jurisdiction but since it has always been a borderline case, in that the height of the dam is very close to 10 ft., it has been inspected annually and a report made thereon. Each year comments regarding the dam have been forwarded to the Owner but he never has taken any steps to improve the structure.

Since the Owner is well aware of conditions at the dam and, since he has been notified of conditions periodically, there seems to be no further need to notify him again since the dam is apparently going to be abandoned for the time being and no water is stored.

G. Don Noble Dam

The work of raising the dam embankment and the construction of the swale spillway at the right end of the dam should be completed. Earth fill has been placed on the dam and compacted in one section but fill remains, as it was dumped, on a major portion of the embankment top. The dam embankment is becoming heavily brush covered and this brush should be kept cut down. Also, the practice of throwing brush and limbs over the downstream slope of the embankment should stop. The embankment surface should be kept clear of trash and brush so that it can be properly inspected and the need for any maintenance recognized at an early date.

At the time of the last inspection, the pond was found to be about empty, though the drawoff gate is closed. It is assumed that seepage thru the embankment, the low rate of in-flow, plus evaporation has caused the water level to be low.

H. Cooley Estate Dam

The emergency spillway built at this dam following the flood of August 1955 was found to be in very good condition. The culvert spillway, was almost completely blocked with stop-logs. This is the usual manner in which the spillway is operated during the Summer months. The embankment of the dam was found to be in very good condition.

The chute at the end of the culvert spillway is in need of masonry repairs at the point where the walls join the floor. The condition is not dangerous and has been pointed out to the Owner. This condition will be noted from time to time and when it is felt that repairs are a necessity, the undersigned will recommend another written report to the Owner, outlining work needed to be done.

I. Westfield Water Dept. Dams

(a) Arnold Dam This dam was found to be in very good condition. The small embankment is well shaped and all brush has been cut from the top and both surfaces of the dam. Two cast iron grates were found to be blocking the spillway entrance and these were removed.

(b) Wells Mills Dam This dam is in the same general condition as reported a year ago. The dam is dilapidated and still flood washed as the result of the storm of August 1955. The brook flows thru the sand and gravel filled pond basin and hardly any water is stored. Leakage occurs thru the embankment of the dam and emerges from the downstream face of the stone masonry in the vicinity of the discharge pipe outlet. As operated now, though the dam is in very poor condition, the structure is safe and satisfactory.

(c) Strong Dam This dam was found to be in relatively good condition. The embankment and the stone masonry wall were satisfactory. No leakage of any consequence was found to be occurring and the spillway structure was satisfactory. It was noted however, that a small amount of settlement has taken place in the embankment just at the left of the main spillway, and just back of the downstream embankment wall. The condition is satisfactory for now but will be watched in the future for further settlement of the earth embankment or outward movement of the masonry wall.

(d) Granville Reservoir Dam The embankment at this dam was found

to be satisfactory with two minor exceptions. (a) There are a few clumps of brush growth that prevent proper inspection of the earth embankment surface in the areas of this growth. (b) Some maintenance is needed at the stone paved surface runoff gutters which convey storm water from the surface of the dam to the discharge point below the toe.

In certain locations it would appear as if the sod on the embankment is in need of being fertilized. If fertilizer has not been applied to the dam in a number of years, it might be well to consider fertilizing the entire embankment in the early Spring of 1962.

The spillway masonry chute is in need of patching and minor repairs along its length. In many places large areas of concrete patching has become loose and in other areas erosion has eaten into the concrete masonry. The toe drainage system has been cleaned and cleared and greatly improved. It was noted that there are two small seepage holes in the earth not too far distant from the masonry inlet and grate structure located at the toe of the dam. These seepage holes which carry surface runoff into the ground may be purposely built seepage pits. On the other hand, they could result from a broken or leaking joint in an underground drain pipe.

It would seem advisable to consider the placing of mass concrete at the end of the spillway chute to prevent any further washout and erosion in the natural bed of the brook.

(e) Winchell Dam This dam was found to be in very good condition. No flashboards were present on the crest of the sillway.

(f) Japhet Dam This dam was found to be in very good condition. It was noted, however, that some small amount of brush was growing from about the stone lip of the spillway and also that the first joint in the stone block construction at the left abutment near the spillway lip is in need of pointing. Neither of these two conditions are serious enough to require any immediate attention and they will be checked again in 1962. If at that time they still exist and show any signs of becoming more extensive, a recommendation in connection with corrective measures will then be made.

J. Granville State Forest Dam

The earth embankment at this dam was found to be in satisfactory

condition. The stone spillway is in need of patching and repair but the need for the work is not critical as yet and thus no recommendation for repairs is forwarded at this time. The condition will be observed again in 1962.

K. E. A. Jensen Dam

This dam was found to be in very good condition. At the time of the last inspection the pond was about 3/4 empty as the result of pumping the water for irrigation purposes. Because of the low water, the majority of the embankment was visible for inspection. The embankment as a whole was found to be well shaped and in good condition. The upstream surface below high water level was noted to be quite rough but stable. Turf growth above high water line was found to be very good.

Leakage thru the drawoff pipe as reported previously was still occurring and since it does occur with the pond drawn down low, it can be expected that the leakage is probably entering the pipe at the plug located in the upstream end. I discussed this matter with the Owner and he anticipates draining the pond completely this Fall and installing a better plugging device, probably a valve, on the end of the pipeline. The spillway was clean and clear of debris and well shaped.

L. Jarm Dam

There are actually two small dams on the Jarm property. Both impound a very small quantity of water and since the drainage area involved is less than a square mile, and the height of the dams is quite low, neither of the structures as yet come under County jurisdiction. Since they are not too far distant from the Woodger Dam, they are inspected annually to be certain that they are not enlarged to the point whereby they would come within County control. At the time of the last inspection, the Jarm dams were in good condition.

Respectfully submitted

George H. McDonnell
County Hydraulic Engineer

GHM/cmb

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton
Chairman
[illegible]
Floyd W. Fradet
Stephen A. Moynahan

October 1, 1969

Massachusetts Dept. of Natural Resources
Granville State Forest
Granville, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that the small dam on Halfway Brook in the Reservation easterly of West Hartland Road has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "Granville State Forest Dam The stone masonry of this dam was found to be o.k. The earth embankment section of the dam was in satisfactory condition. Stoplogs in the spillway were to the usual height and water level in storage was at the crest of the upper stoplog. The spillway bridge was in satisfactory condition.
>
> The floor of the spillway facility directly below the stoplogs is in need of repairs and concreting to prevent further erosion and deterioration of the floor. If repairs are not made in the near future, there is a good possibility that extension of the erosion will cause possible damage to the side walls just below the spillway structure. Mass concrete or concreted riprap can very easily, inexpensively and quickly provide the necessary repairs to prevent any further extension of the erosion damage. The condition as existing does not now endanger the dam, but should the erosion continue, this small dam could be endangered and the cost of repairs and reconstruction could be greatly increased because of the need for repairing extended and expanded damage."

As pointed out by the County Hydraulic Engineer in his report to our Board, minor repairs made now will prevent the need for more major and possibly more expensive repairs at a later date. The spillway floor and the related sidewalls should be repaired with mass concrete or a combination of stone and concrete in the very near future.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

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Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton
Chairman
[redacted]
Lloyd W. Fradet
Stephen A. Moynahan

October 1, 1969

Mr. G. E. Woodger
Off Main Street
Granville, Massachusetts

Dear Sir:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams of Hampden County, you are hereby advised that the dam located on your property and adjacent to the access road leading to your home from Main St., in Granville has been recently inspected by our Engineer and your attention is called to the following conditions noted and recommendations made by him.

> "Woodger Dam This dam is in poor condition and is not too well maintained. There is evidence of surface wash on each side of the dam, particularly on the left side. This surface wash is apparently finding its way thru the rock fill and is washing out fine grained material resulting in settlement. This could be the initial action which might lead to eventual failure of the dam.
>
> In the opinion of the undersigned, this dam is a borderline structure and does not come under the jurisdiction of the County. The dam is inspected periodically to be certain that it is not raised to a point whereby it would become high enough and store sufficient water to come under County jurisdiction.
>
> It would be advisable to inform the owner of conditions noted by the undersigned and recommend to the owner that the dam should be maintained and repairs made if he wishes to protect his investment. Loss of the dam would not release enough water to do damage to persons and property downstream. Any loss that might occur would probably be related to the roadway that passes directly in front of the dam and is a part of the dam. This road is apparently a private road leading just to the property of the owner."

The report of the engineer is sent to you for whatever action you wish to take. As mentioned, the dam does not come under County jurisdiction. However, since repairs to the structure could protect the investment you have made in this dam, we thought that you might be interested in the opinion of the County Hydraulic Engineer and in having a copy of his report on your dam.

Any further information concerning this matter which you may desire will be furnished by this office upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

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GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

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BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Granville
August 12, 1970

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

Inspections conducted recently in the Town of Granville have now resulted in the inspection of all dams within that community. Every dam located in the Town of Granville has been examined at least once during the year 1970. The following is a report on the general conditions noted at each of the dams located within the Town of Granville.

A. DeGano Dam

The embankment and the roadway extending along the top of the embankment were noted to be o.k. There were no cracks or settled areas on the surface of the pavement.

The spillway facility was in good condition. Normal stoplogs were in the spillway opening and water level in storage was just below the top of the upper stoplog. The culvert forming the spillway under the roadway and thru the embankment was in good condition and only a minimum of debris was observed inside the culvert.

There was some seepage at the toe of the dam embankment just to the right of the culvert outlet end wall. This seepage is near a gate box that apparently is on a drawdown pipeline. The seepage may be coming from the drawdown pipeline itself or from along the outside surface of the pipe. The rate of seepage should be checked at the next inspection to determine whether or not there is any increase in the rate of seepage. No soil particles were moving with the trickle of seepage water.

The upstream concrete wall was noted to be in fairly good condition.

B. Phelon Dam

This dam was in the same condition noted in recent years. The toe was wet but there was very little motion to the water standing just below the dam. The embankment is rough in shape but serviceable.

The flood flow spillway at the right end of the dam embankment was clear of any debris and showed little evidence of any erosion.

The vertical shaft spillway was closed off with the beaver control device and the fact that this spillway facility does not operate under normal and low water conditions does not endanger the dam.

Brush growth is occurring on the downstream slope of the dam and in the vicinity of the toe, but the growth, though quite thick, does not endanger this dam. The dam embankment is quite wide for its shallow height.

Water level in storage at the time of inspection was at about normal elevation.

In the opinion of the undersigned, the dam is safe.

C. Woodger Dam

The surface wash problems observed and reported a year ago have been corrected.

This dam still does not come under County jurisdiction since it is on a drainage area of negligible size, it forms a swimming pond of only a few thousand gallons and the height of the dam is just under 10 feet.

The dam itself is a part of the bridge abutment and foundation construction that carries the roadway to the Woodger home across the local stream. The road is a private road and, should the dam fail for any reason, it will only be the private roadway of the owner that would be damaged.

Stoplogs were noted to be at normal elevation and water level in storage was at the usual grade.

D. Noble Cooley Drum Shop Dam

The dam was noted to be in relatively good condition. The road across the top of the dam was good and there were no cracks or settled areas in the pavement.

Spillway was satisfactory. Normal flashboards were in the slots of the flashboard facility at the inlet to the culvert thru the embankment and under the roadway. Water level in storage was at the top of the flashboards.

The spillway culvert was clear of any debris. Some erosion of masonry was noted at the outlet end but this is not bad.

The toe area was o.k. It was relatively dry directly at the base of the embankment adjacent to the downstream concrete wall.

The smaller dike to the left of the dam was o.k.

In the opinion of the undersigned, this dam is safe.

E. Dickinson Dam

This small dam stores a very shallow pond with an average depth of only about 2 feet. The area of the pond is small and the quantity of water stored is negligible.

This dam is so low in height and impounds such a small quantity of water that regardless of its condition, it cannot endanger persons and property downstream. As reported previously, except for the fact that the dam is on a stream with a drainage area much greater than one square mile, the structure would be dropped from the inspection list. It is inspected annually since it is close to the center of Town, is easily accessible for inspection and to be certain the dam has not been enlarged so as to store a greater quantity of water.

F. Don Noble Dam

This dam is in the same general condition as reported at the time of previous inspection. Absolutely no maintenance work whatsoever has been done at the dam and none of the previous recommendations have been followed by the owner. Construction work remains unfinished and the entire embankment is now overgrown with a very thick growth of brush and small trees. The embankment is poorly shaped and earth dumped on top of the embankment a number of

years ago remains in the same general condition as dumped. The piles have now flatened somewhat due to weather erosion.

The swale spillway started at the right end of the dam has never been completed. It is in the same condition as noted and reported previously. However, a growth of turf is beginning to develop in the swale.

It would appear that this dam has been abandoned by the owner. In the opinion of the undersigned, the dam should be properly maintained or it should be breached.

Breaching the dam would be a very simple matter and would only require a few hours time for either a bulldozer or a backhoe. The dam could be breached in the area of the swale spillway at the right of the embankment during the summertime when water level in storage is low. It could be breached just as easily at the left end of the dam just to the left of the drawdown facility. This latter location is more easily accessible to a backhoe. Either location would be readily accessible to a small bulldozer.

G. Cooley Estate Dam

The embankment of this dam is in very good condition. The road across the top of the embankment and the surface of the pavement is o.k. No cracks or settled areas were observed.

The flood flow paved swale spillway at the right side of the embankment was in good condition. It is well shaped and is well maintained.

Tree growth on the embankment is fairly large but it does not endanger the embankment.

The principal spillway was not operating. Full stoplogs were in the opening and a plastic sheet was installed along with the stoplogs to prevent seepage between the individual logs. Water level in storage was about normal, water surface being slightly below the elevation of the top of the upper stoplog.

The downstream toe area a short distance below the embankment proper was quite wet and water seeps steadily from the ground at the usual location observed for many years. There is no earth movement at all and no increase in seepage flow was observed.

The earth embankment was o. k.

The quantity of water stored by the dam is quite small and, even if the dam did fail, it could do no damage to persons and property downstream.

In the opinion of the undersigned, the dam is in satisfactory condition and is safe.

(d) Granville Reservoir Dam This dam is in the best condition observed in a number of years.

The spillway and the spillway chute are o. k. The repair work at the spillway chute and under the chute floor has been completed. The floor and the walls of the chute are satisfactory. Some of the thin gunite on the walls is cracking and lifting but this is a common occurrence with the type of plaster coat applied on certain sections of the spillway chute sidewalls.

The spillway energy disapating wall at the end of the chute was noted to be o. k.

The spillway crest was in good condition. Water level was about two feet below the elevation of the crest. No flashboards were on the crest.

The embankment was in very good condition. The roadway along the top is in fair condition. The bridge carrying the roadway over the spillway and the foot bridge out to the gate house were o. k.

The water side slope of the embankment and its stone filled surface were noted to be in good condition.

The downstream slope of the embankment was in the best shape observed in some time. All brush has been cut and all of the surface drainage system has been dug out, cleared, and exposed. The undersigned was advised by the Water Dept. employee in charge of the dam that the stone masonry lining of the surface drainage system on the downstream face of the embankment will be repaired this year where necessary. Loose stones will be reset and open joints will be concreted.

The toe area was in very good condition. All brush growth has been cleared away. The toe drains were operating. One burrow hole was observed at the toe of the dam near the one large tree. This was pointed out and the supervisor of the dam will fill the burrow hole.

The concrete chute of the principal spillway is in need of repair. The need for repairs was pointed out to the owner at the time of the last inspection. Repairs were planned for this year. Since the summer season is only a little more than half gone, it is possible that the owner plans to repair the concrete of the chute later this summer or early this fall. If repairs have not been made by the time of the inspection in 1971, the owner should then be advised to repair the eroded and worn concrete.

H. Westfield Water Department Dams

(a) Arnold Dam This small dam forming a water hole for fire protection is in very good condition. The embankment has been cleared of all brush growth and a good turf cover has been developed. The toe area was noted to be o.k. Water level in storage was at the crest of the spillway. There were no stoplogs in the spillway opening and the small spillway culvert was o.k. and functioning.

The pond formed is quite small. Its capacity is probably in the range of 50,000 gallons. The dam is very low and loss of the dam would never do any damage to persons and property downstream. In the opinion of the undersigned, the dam is safe and in very good condition.

(b) Wells Mills Dam This dam is in the same general condition as reported for the last fifteen years. The access road and some of the washed out areas have been filled and graded. No water is ponded by the dam since the entire pond volume has been completely filled with sand and gravel washed down from upstream during the hurricane flood of August in 1955.

The masonry of the dam still leaks some but this leakage is of no importance. The dam is now nothing more than a waterfall in the stream and the existance of the dam does not endanger persons and property downstream in any manner whatsoever.

There doesn't seem to be any need to continue inspections of this old dam and, unless advised to the contrary, no further inspections will be made.

(c) Strong Dam The stone masonry forming this dam is in fair condition. The flood flow swale spillway across the top of the dam was noted to be o.k.

The principal spillway was satisfactory. Stoplogs were in the slots of the spillway crest to the usual height but no water was stored in the pond. Leakage thru the stoplogs and seepage under and thru the dam equaled the brook flow at the time of inspection.

(e) Winchell Dam Vegetation growing from the joints of the stone masonry should be removed and regrowth discouraged. If the vegetation is allowed to grow and roots become extensive and large, the stone block joints will be damaged and the cement grout will be displaced. Open joints of the block masonry will then be subject to alternate freezing and thawing in the winter time with eventual damage to the stone masonry.

Particular attention should be given to both sides of the dam and the area at the gate house.

The spillway was noted to be in fairly good condition. There were no flashboards on the spillway crest and water level in storage was at crest elevation. Some water was overflowing the spillway.

(f) Japhet Dam The stone masonry is in good condition but all vegetation growing from joints in the masonry should be removed and regrowth discouraged. Continued growth of vegetation will dislodge the jointing material and result in damage to the masonry as described in the case of the Winchell Dam hereinbefore.

The spillway was in good condition. No flashboards were on the crest and the water level in storage was flowing over the crest.

The toe area of the dam was o.k. No erosion was noted at the toe in the brook.

I. Granville State Forest Dam

The stone and concrete masonry of the spillway channel directly below the foot bridge and downstream of the stoplogs is eroded and broken. The stone sidewall on the right side is crumbling and failing at the base. This is the wall just downstream of the cut stone wall of the spillway. The spillway channel should be concreted in such a way that the sidewall foundations will be protected.

The left sidewall is not as bad as the right sidewall but unless maintenance work is done, the base of this wall will deteriorate also.

Spillway stoplogs were o.k. and water level in storage was at the top of the upper stoplogs.

The stone masonry wall of the dam itself was in good condition.

As reported a year ago, the condition of each of the sidewalls downstream of the spillway and the broken spillway channel does not endanger the dam itself but should deterioration continue, the small

dam could be endangered and the cost of necessary repairs and reconstruction could be greatly increased. Inexpensive and simple repairs now will undoubtedly prevent more extensive and more costly repairs at a later date.

J. E. A. Jensen Dam

The embankment of this dam was found to be very good as to shape. A suitable wild growth of turf is developing on the surface of the embankment. Brush has been cut.

The toe area of the dam was dry except directly at the drawdown pipe outlet. Here water was noted to be standing and the amount of seepage was negligible.

The spillway channel located to the left of the dam embankment was o. k. There was no debris in the channel and water level in storage was at the channel crest. Little or no erosion was noted in the earth bottom of the spillway channel.

The very heavy stone fill at the base of the dam embankment and forming the downstream toe was noted to be in good condition.

This dam has been well maintained this year and in the opinion of the undersigned it is safe.

Respectfully submitted,

George H. McDonnell
County Hydraulic Engineer

GHM/cad



End of Book D25-1~ Dams ~ Hampden County